

DAIRY HANDBOOK
AND
DICTIONARY

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DAIRY HANDBOOK AND DICTIONARY

A Practical Reference Work for Dairy Farmers Producers of Market Milk, Butter, Cheese, and Ice Cream Dairy Experts, Dairy Executives and Dairy Superintendents County Agents Teachers Librarians To these groups, and all other interested readers this book is dedicated

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J H FRANSEN

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NUTRIENTS REQUIRED BY AVERAGE WEIGHT MAN

(According to National Research Council)

Nutrient	Amount Required	Nutrient Content of Milk in one Quart	
		Total	Daily Need Supplied
			%
Calories (heat units)	3,000	670	22.3
Protein, Grams	70	34	48.6
Calcium, Grams	0.8	1.15	143.8
Phosphorus, Grams	1.32*	0.88	66.7
Iron, milligrams	12.0	0.322	2.8
Vitamin A, I.U.	5,000	1,200 (w)	24.0
	5,000	1,800 (s)	36.0
Thiamine, milligrams	1.5	0.33	22.0
Riboflavin, milligrams	2.0	1.65	82.0
Ascorbic acid, milligrams	75.0	14.0	18.7
Niacin, milligrams	18.0	0.85	4.7

* H. C. Sherman

(w) Winter milk

(s) Summer milk

MILK, HOW UTILIZED

Percentage Utilization of Milk Produced, United States,
Average 1945-54, Annual 1954-56¹

Utilization	Average			
	1945-54 %	1954 %	1955 %	1956 ² %
Creamery butter, net	22.2	23.5	22.3	22.2
Cheese	10.1	11.2	11.0	11.0
Evaporated, condensed, and dry whole milk	7.0	5.6	5.8	5.7
Frozen dairy products, net	6.1	6.3	6.6	6.7
Other manufactured products	.6	.9	.9	1.0
Total factory products	46.0	47.5	46.6	46.6
Farm butter	4.4	2.9	2.7	2.4
Fluid consumption				
Farm	9.9	8.3	8.1	8.0
Nonfarm	35.8	37.7	39.1	39.5
Fed to calves	2.8	2.7	2.7	2.5
Other uses	1.1	.9	.8	1.0

¹ For data on quantities of milk see table on Production and Utilization of Milk, United States, 1947-56.

² Preliminary.

* Courtesy of Agricultural Marketing Service, U.S.D.A.

COMPARISON OF WATER IN MILK
WITH SOME OTHER FOODS*

Food	Water per cent	Calories per lb
Cucumbers	96.1	6.
Tomatoes	94.1	10.
Celery	93.7	100
Asparagus	93.0	120
Cabbage	92.4	130
Turnips	90.9	15.
String Beans	88.9	190
Carrots	88.2	20.
Onions	87.5	220
MILK	87.0	310
Peaches	86.9	230
Rolled oats (cooked)	81.8	290
Apples	81.1	290

* U S Dept. Agric. Circular 549

MILK, COMPOSITION OF*

Average Composition of Milks of Various Mammals

Species	Water %	Fat %	Sugar %	Protein %	Casein %	Albumin %	Mineral Matter %
Cow	87.55	3.78	4.73	3.21	2.78	0.60	0.71
Human	87.42	3.77	6.60	1.96	1.03	1.26	0.26
Goat	87.00	4.14	4.51	3.70	3.20	1.09	0.78
Sheep	83.00	5.30	4.60	6.30	4.60	1.70	0.80
Mare	83.61	1.10	6.41	4.83	1.24	0.73	0.43
Ass	91.23	1.15	6.00	1.50	0.91	0.53	0.40
Rat	68.30	14.79	2.83	11.77	9.90	0.91	1.50
Monkey		3.93	5.89	2.09			0.26
Water Buffalo	82.05	7.98	5.18	4.00			0.79
Camel	81.61	5.38	3.26	2.98			0.70
Reindeer	65.32	19.73	2.61	1.91	8.69	2.22	1.43
Llama	86.55	3.15	5.60	3.90	3.00	0.90	0.80
Hog	81.82	6.85	5.00	6.19			0.98
Dog	79.26	8.17	4.00	7.53	4.29	1.88	1.36
Cat	82.17	3.33	4.91	9.08	3.12	5.96	0.51
Rabbit	69.50	10.45	1.95	15.54			2.56
Elephant	68.00	19.60	8.80	3.10			0.50
Whale	70.10	19.60		9.50			1.00
Porpoise	41.11	45.80	1.33	11.19			0.57
Silver Fox	81.88	5.42	5.11		0.51	6.20	0.88
Hippopotamus	90.43	4.51	4.40				0.11
Dolphin	48.76	43.71					0.46
Porcupine		31.0					

* Milk and Milk Processing — B. L. Herrington (McGraw Hill Publications)

COMPOSITION, RELATION, AND WEIGHTS OF MILKS AND CREAMS

<i>Fat %</i>	<i>Non-Fat Solids %</i>	<i>Total Solids %</i>	<i>Ratio Fat to Non-Fat Solids</i>	<i>Fat, % of Total Solids</i>	<i>Specific Gravity At 68° F.</i>	<i>lb. per gal.</i>	<i>lb. per qt.</i>
3.0	8.53	11.33	1:2.77	25.20	1.034	8.61	2.15
3.1	8.40	11.50	1:2.71	26.95			
3.2	8.46	11.66	1:2.64	27.47			
3.3	8.52	11.82	1:2.58	27.93			
3.4	8.55	11.95	1:2.52	28.41			
3.5	8.60	12.10	1:2.46	28.90	1.033	8.60*	2.15
3.6	8.65	12.25	1:2.40	29.40			
3.7	8.69	12.39	1:2.35	29.85			
3.8	8.72	12.52	1:2.30	30.30			
3.9	8.76	12.66	1:2.25	30.77			
4.0	8.79	12.79	1:2.20	31.25	1.032	8.59	2.15
4.1	8.82	12.92	1:2.15	31.74			
4.2	8.86	13.06	1:2.11	32.15			
4.3	8.89	13.19	1:2.07	32.57			
4.4	8.92	13.32	1:2.03	33.00			
4.5	8.95	13.45	1:1.99	33.44	1.032	8.58	2.14
4.6	8.98	13.58	1:1.95	33.90			
4.7	9.01	13.71	1:1.92	34.25			
4.8	9.04	13.84	1:1.88	34.72			
4.9	9.07	13.97	1:1.85	35.09			
5.0	9.10	14.10	1:1.82	35.46	1.031	8.58	2.14
18.0	7.31	25.31	1:0.41	71.11	1.015	8.48	2.12
20.0	7.13	27.13	1:0.36	73.71	1.013	8.43	2.11
22.0	6.95	28.95	1:0.51	75.30	1.011	8.42	2.11
25.0	6.68	31.68	1:0.27	78.91	1.008	8.37	2.10
30.0	6.24	36.24	1:0.21	82.78	1.004	8.36	2.09
35.0	5.79	40.79	1:0.16	85.81	1.000	8.32	2.08
40.0	5.35	45.35	1:0.13	88.20	0.995	8.28	2.07
45.0	4.90	49.90	1:0.09	90.11	0.985	8.22	2.05

* Gallon of water = 8.5359 lb.
See Gallon, Definition of

CONSTITUENTS OF MILK**

The following table gives the approximate concentration of the constituents in normal cow milk:

<i>Constituent or Group of Constituents</i>	<i>Approximate Concentration Weight per liter of Milk</i>
1. Water	860.0 - 880.0 gm.
2. Lipides in emulsion phase	
a. Milk fat (a mixture of mixed triglycerides)	30.0 - 50.0 gm.
b. Phospholipides (Lecithins, cephalins, sphingomyelins, etc.)	0.50 gm.
c. Cerebrosides	?
d. Sterols	0.10 gm.
e. Carotenoids	0.10- 0.50 mg.
f. Vitamin A	0.10- 0.50 mg.
g. Vitamin D	0.4 µg.
h. Vitamin E	1.0 mg.

Constituent or Group of Constituents Continued

Approximate
Concentration
Weight per liter of
Milk

i Vitamin K	trace
3 Proteins in colloidal dispersion	
a. Casein (α , β , γ fractions) (1)	25.0 gm
b β lactoglobulin (1)	3.0 gm
c α lactalbumin	0.7 gm
d Albumin probably identical to blood serum albumin	0.3 gm
e Fuglobulin	0.3 gm
f Pseudoglobulin	0.3 gm
g Other albumins and globulins	1.3 gm
h Mucins (?)	?
i Fat globule protein (?)	0.2 gm
j Enzymes	?
1 Catalase	
2 Peroxidase	
3 Xanthine oxidase	
4 Phosphatases (Acid and Alkaline)	
5 Aldolase	
6 Amylases (α and β)	
7 Lipases and other esterases	
8 Proteases	
9 Carbonic Anhydrase	
10 Salolase (?)	
4 Dissolved materials	
a Carbohydrates	
1 Lactose (α and β)	42-50 gm
2 Glucose	50 mg
3 Other sugars	traces
b Inorganic and organic ions and salts	
1 Calcium*	1.25 gm
2 Magnesium*	0.10 gm
3 Sodium	0.50 gm
4 Potassium	1.50 gm
5 Phosphates* (as P_2O_5)	2.10 gm
6 Citrates* (as citric acid)	2.00 gm
7 Chloride	1.00 gm
8 Bicarbonate	0.20 gm
9 Sulfate	0.10 gm
10 Lactate (?)	0.02 gm
c Water soluble vitamins	
1 Thiamine	0.4 mg
2 Riboflavin	1.5 mg
3 Niacin	1.2 mg
4 Pyridoxine	0.2 - 0.7 mg
5 Panthothenic acid	3.0 mg
6 Biotin	50.0 μg
7 Folic acid	1.0 μg
8 Choline (total)	150.0 mg
9 Vitamin B_{12}	7.0 μg
10 Inositol	180.0 mg
11 Ascorbic acid	20.0 mg
d Nitrogenous materials not proteins or vitamins (as N)	
1 Ammonia (as N)	250.0 mg
2 Urea (as N)	2.0 - 12.0 mg
3 Amino acids (as N)	100.0 mg
	3.5 mg

Constituent or Group of Constituents, Continued	Approximate Concentration Weight per liter of Milk
4. Creatine and creatinine (as N)	15.0 mg.
5. Methyl guanidine (?)	?
6. Uric acid	7.0 mg.
7. Adenine	
8. Guanine	
9. Hypoxanthine (?)	
10. Xanthine (?)	
11. Uracil-4-carboxylic acid (orotic acid)	50.0 - 100.0 mg.
12. Hippuric acid	30.0 - 60.0 mg.
13. Irdican	0.3 - 2.0 mg.
14. Thiocyanate (?)	?
c. Gases (milk exposed to air)	
1. Carbon dioxide	100.0 mg.
2. Oxygen	7.5 mg.
3. Nitrogen	15.0 mg.
f. Miscellaneous	
1. Esters of phosphoric acid not yet identified (as phosphorus)	0.10 gm.
5. Trace elements (form of occurrence not elucidated)	
Usually present	
(3) Rb, Li, Ba, Sr, Mn, Al, Zn, B, Cu, Fe, Co, I	
Occasionally present or questionable	
(3) Pb, Mo, Cr, Ag, Sn, Ti, F, Si, V.	

*Partly in colloidal dispersion.

(?) Presence, identity or concentration uncertain.

(1) α , β , γ fractions mean alpha, beta and gamma.

(2) μ g. means microgram, one-millionth of a gram.

(3) Rb (Rubidium), Li (Lithium), Ba (Barium), Sr (Strontium), Mn (Manganese), Al (Aluminum), Zn (Zinc), B (Boron), Cu (Copper), Fe (Iron, ferrum), Co (Cobalt), I (Iodine), Pb (Lead, plumbum), Mo (Molybdenum), Cr (Chromium), Ag (Silver, argentum), Sn (Tin, stannum), Ti (Titanium), F (Fluorine), Si (Silicon), V. (Vanadium).

** Courtesy of Robert Jenness, Ph.D.
University of Minnesota, St. Paul

PRODUCTION AND UTILIZATION OF MILK, UNITED STATES, 1917-56*

Source and Use	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926 ^a
Milk Production	116 814	112 671	116 103	113 602	114 681	114 671	120 221	122 094	123 128	125 698
On farms	118 114	113 671	117 003	117 302	115 181	115 071	120 521	122 294	123 228	125 698
Total ^b										
Utilization (milk equivalent)										
Manufacture (in plants)										
Creamery butter,	27 430	21 980	29 149	28 641	24 086	24 178	28 877	29 652	28 435	28 914
Total	27 430	21 980	29 149	28 641	24 086	24 178	28 877	29 652	28 435	28 914
From whey cream	26 600	24 209	23 507	23 803	21 089	23 563	27 985	28 691	27 400	27 079
Net										
Cheese	9 401	8 897	9 384	8 972	8 791	8 551	10 239	10 475	10 058	10 031
American	2 381	2 352	2 569	2 853	2 778	3 068	3 104	3 258	3 461	3 715
Other										
Canned milk	6 899	7 271	5 893	6 177	6 221	6 087	5 414	5 507	5 490	5 403
Evaporated	369	403	234	145	135	124	96	58	74	149
Sweetened condensed milk	369	403	402	557	558	550	558	599	649	665
Unsweetened	423	483	402	557	558	550	558	599	649	665
Sweetened	19	93	102	65	92	102	103	94	90	94
Dry whole milk	1 250	1 293	956	932	999	774	791	718	812	820
Frozen dairy products										
Ice cream and other frozen products ^c	8 223	8 223	8 127	8 106	8 109	8 941	9 221	9 150	9 610	10 007
Duplication of fat from butter and condensed milk ^d	1 501	1 501	1 306	1 302	1 488	1 400	1 421	1 401	1 480	1 530
Net from milk and cream	7 542	6 722	6 821	6 804	7 001	7 541	7 797	7 746	8 160	8 477
Other factory products ^e	515	561	561	724	959	916	967	1 032	1 123	1 232
Total factory products ^f	55 412	51 861	55 321	55 170	51 605	51 205	57 013	58 074	57 401	58 618
Farm butter	6 154	5 808	5 440	5 168	4 746	4 213	3 476	3 562	3 510	3 966
Fluid consumption										
Farms ^g	12 600	12 000	11 700	11 500	11 300	11 200	10 700	10 100	10 000	10 000
Nonfarm	40 400	40 000	40 600	41 700	42 800	43 700	41 600	40 100	40 200	40 700
Fed to calves	3 194	3 044	3 163	3 256	3 449	3 345	3 358	3 344	3 241	3 199
Exports and storage ^h	342	148	242	56	116	79	148	45	26	4
Others ⁱ	546	90	1 018	812	1 167	1 224	1 306	1 159	1 000	1 219

* Courtesy of Agricultural Marketing Service, U.S.D.A.

^a Includes an allowance for milk produced by cows not on farms.^b Includes ice cream, milk sherbet, ice milk, and miscellaneous minor frozen products.^c Milk equivalent of butter and condensed milk used in ice cream.^d Includes dry cream, malted milk, dry part skim milk, dry ice cream, milk, and cottage cheese.^e Includes net milk equivalents of butter and frozen dairy products to avoid double counting of milk from which fat was reused in making a second dairy product.^f Includes an allowance for fluid consumption on farms not producing milk in addition to the consumption on farms where milk is produced.^g Net movement of whole milk or cream into export or storage channels. A negative figure represents net imports or net out of storage movement during the year.^h Residual, including miscellaneous minor uses and any inaccuracies of independently determined production and use items.ⁱ Preliminary.

**ANNUAL CONSUMPTION OF FLUID MILK AND CREAM:
NONFARM, FARM, TOTAL, AND CIVILIAN, UNITED STATES, 1924-54***

Year	Nonfarm		Farm		Total Civilian		Con- sumption per capita
	Quan- tity con- sumed	Con- sumption per capita	Quan- tity con- sumed	Con- sumption per capita	Quan- tity con- sumed	Quan- tity con- sumed	
	Billion pounds	Pounds	Billion pounds	Pounds	Billion** pounds	Billion pounds	Pounds
1924	25.6	304	13.3	421	38.9	38.9	336
1925	26.3	306	13.3	421	39.6	39.6	337
1926	27.0	308	13.2	422	40.2	40.2	338
1927	27.6	308	13.0	419	40.6	40.6	336
1928	28.3	310	12.9	416	41.2	41.2	337
1929	29.3	317	12.7	410	42.0	42.0	340
1930	29.2	311	12.9	416	42.1	42.1	337
1931	28.6	303	13.5	430	42.1	42.1	335
1932	28.8	305	14.1	439	42.9	42.9	339
1933	28.5	302	14.4	439	42.9	42.9	337
1934	26.9	282	14.4	440	41.3	41.3	322
1935	27.9	289	14.1	434	42.0	42.0	326
1936	29.0	297	13.8	430	42.8	42.8	330
1937	29.5	298	13.7	434	43.2	43.2	331
1938	29.6	295	13.7	436	43.3	43.3	329
1939	30.2	298	13.9	446	44.1	44.1	332
1940	30.6	297	13.7	443	44.3	44.3	331
1941	31.6	302	13.5	444	45.1	44.7	334
1942	34.8	326	13.3	439	48.1	47.2	354
1943	37.5	343	12.7	474	50.2	48.5	371
1944	38.4	353	12.9	500	51.3	49.6	381
1945	40.7	373	12.8	492	53.5	52.2	399
1946	42.2	367	13.1	485	55.3	54.6	389
1947	41.1	347	12.6	463	53.7	53.3	369
1948	40.6	333	12.1	460	52.7	52.3	355
1949	41.2	331	11.8	452	53.0	52.6	352
1950	42.2	329	11.5	438	53.7	53.2	349
1951	43.3	331	11.5	467	54.8	53.9	352
1952	44.2	333	11.4	456	55.8	54.7	352
1953	45.3	329	10.8	470	56.1	55.2	349
1954	46.7	331	10.5	473	57.2	56.3	349

* Courtesy of Milk Industry Foundation

** Incl. consumption by armed forces.

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	Whole Milk				Cream				Plain Ice Cream				Chocolate Ice Cream				Butter			
	Light		Heavy		Whip-		Total		Stabil-		Weight		Total		Milk		Milk		Milk	
	Milk	Total	Milk	Whip-	Milk	fat	Milk	fat	fat	Min.	Min.	per	Milk	fat	Min.	fat	Min.	fat	Min.	fat
	Min. %	Min. %	Min. %	Min. %	Min. %	Min. %	Min. %	Min. %	Min. %	Min. %	Min. %	Min. %	Min. %	Min. %	Min. %	Min. %	Min. %	Min. %	Min. %	Min. %
Oklahoma	5.5	8.0 ¹¹	18.0	30.0	36.0	10.0	18.0	18.0 ¹²	5	4.5	1.6	8.0	18.0	4.5	1.6	80.0	80.0	80.0	80.0	80.0
Oregon	5.2	8.5	17.7	30.0	36.0	10.0	18.0 ¹²	18.0 ¹²	5	4.5	1.6	10.0	18.0	4.5	1.8	80.0	80.0	80.0	80.0	80.0
Pennsylvania	5.25	8.5	18.0	30.0	36.0	10.0	18.0	18.0	5	4.75	1.8	8.0 ¹³	18.0	4.75	1.8	80.0	80.0	80.0	80.0	80.0
Puerto Rico	5.0	8.0	18.0	30.0	36.0	10.0	18.0	18.0	5	4.5	1.6	8.0 ¹⁴	16.0 ¹⁵	4.5	1.6	80.0	80.0	80.0	80.0	80.0
Rhode Island	5.25	8.25	18.0	30.0	36.0	10.0	18.0	18.0	5	4.25	1.6	8.0 ¹⁴	16.0 ¹⁵	4.25	1.6	80.0	80.0	80.0	80.0	80.0
South Carolina	5.0	8.0	18.0	30.0	36.0	10.0	18.0	18.0	5	4.5	1.6	8.0 ¹⁴	16.0 ¹⁵	4.5	1.6	80.0	80.0	80.0	80.0	80.0
South Dakota	5.25	8.25	18.0	30.0	36.0	10.0	18.0	18.0	5	4.5	1.6	8.0 ¹⁴	16.0 ¹⁵	4.5	1.6	80.0	80.0	80.0	80.0	80.0
Tennessee	5.25	8.3	18.0	30.0	36.0	10.0	18.0	18.0	5	4.5	1.6	8.0 ¹⁴	16.0 ¹⁵	4.5	1.6	80.0	80.0	80.0	80.0	80.0
Texas	5.25	8.3	18.0	30.0	36.0	10.0	18.0	18.0	5	4.5	1.6	8.0 ¹⁴	16.0 ¹⁵	4.5	1.6	80.0	80.0	80.0	80.0	80.0
Utah	5.25	8.3	18.0	30.0	36.0	10.0	18.0	18.0	5	4.5	1.6	8.0 ¹⁴	16.0 ¹⁵	4.5	1.6	80.0	80.0	80.0	80.0	80.0
Vermont	5.25	8.5	18.0	30.0	36.0	10.0	18.0	18.0	5	4.5	1.6	8.0 ¹⁴	16.0 ¹⁵	4.5	1.6	80.0	80.0	80.0	80.0	80.0
Virginia	5.25	8.5	18.0	30.0	36.0	10.0	18.0	18.0	5	4.5	1.6	8.0 ¹⁴	16.0 ¹⁵	4.5	1.6	80.0	80.0	80.0	80.0	80.0
Washington	5.0	8.3	18.0	30.0	36.0	10.0	18.0	18.0	5	4.5	1.6	8.0 ¹⁴	16.0 ¹⁵	4.5	1.6	80.0	80.0	80.0	80.0	80.0
West Virginia	5.0	8.3	18.0	30.0	36.0	10.0	18.0	18.0	5	4.5	1.6	8.0 ¹⁴	16.0 ¹⁵	4.5	1.6	80.0	80.0	80.0	80.0	80.0
Wisconsin	5.0	8.25	18.0	30.0	36.0	10.0	18.0	18.0	5	4.5	1.6	8.0 ¹⁴	16.0 ¹⁵	4.5	1.6	80.0	80.0	80.0	80.0	80.0
Wyoming	5.25	8.25	18.0	30.0	36.0	10.0	18.0	18.0	5	4.25	1.6	10.0	18.0	4.25	1.6	80.0	80.0	80.0	80.0	80.0

¹ Grade A, milk fat, not less than 3.25%.

² Grade A, milk fat, not less than 4%; total milk solids not less than 12%.

³ Pasteurized milk fat not less than 3.5%.

⁴ Grade A, milk solids not fat, not less than 8.5%.

⁵ Grade A, milk fat, not less than 3.25%.

⁶ Grade A requirement only.

⁷ Grade A, milk fat, not less than 3.75%.

⁸ When labeled "New Jersey Grade A Pasteurized," milk fat not less than 4.0%; total milk solids, not less than 12.75%.

⁹ Market field milk only.

¹⁰ Standardized milk, milk fat, not less than 3.5%.

¹¹ Grade A, milk solids not fat, not less than 8.25%.

¹² Vanilla only, total milk solids, not less than 20%.

¹³ Total solids, not less than 27%.

¹⁴ Total solids, not less than 29%.

¹⁵ Must meet the standard for plain ice cream, except for such reduction as is due to added flavoring ingredients but in no case less than the minimum shown.

¹⁶ Chocolate ice cream must meet the standard of plain ice cream.

¹⁷ Artificially flavored ice cream must meet the standards of plain ice cream.

¹⁸ Before the addition of fruit, nuts or chocolate.

¹⁹ Fruit ice cream, not less than 1.4 lb.

²⁰ Total solids, not less than 26%.

²¹ Taken from U.S.D.A. Handbook No. 51, Agricultural Marketing Service.

FEDERAL STANDARDS FOR THE
COMPOSITION OF CHEESE*

	Milk fat in solids		Milk fat		Moisture	
	Min %	Max %	Min %	Max %	Min %	Max %
Asiago						
Fresh	50.0					45.0
Medium	45.0					50.0
Old	42.0					52.0
Blue	50.0					46.0
Brick	50.0					44.0
Caciocavallo siciliano	42.0					40.0
Camembert	50.0					
Cheddar	50.0					39.0
Cottage						
Plain						80.0
Creamed			4.0			80.0
Colby	50.0					40.0
Cook						80.0
Cream			33.0			55.0
Edam	40.0					45.0
Gammelost						52.0
Gorgonzola	50.0					42.0
Gouda	46.0					45.0
Granular	50.0					39.0
Gruyere	45.0					39.0
Hard	50.0					39.0
Hard grating	32.0					34.0
High moisture jack	50.0				+44.0	50.0
Limburger	50.0					50.0
Monterey	50.0					44.0
Munster	50.0					46.0
Neufchatel			20.0	-33.0		65.0
Nuworld			50.0			46.0
Parmesan	32.0					32.0
Provoloni	45.0					45.0
Romano	38.0					34.0
Roquefort	50.0					45.0
Sapsago						38.0
Semisoft	50.0					50.0
Swiss	43.0				+39.0	41.0
Part skim spiced	20.0	-50.0				
Semisoft part skim	45.0	-50.0				50.0
Soft ripened	50.0					
Spiced	50.0					
Washed curd	50.0					42.0

Most states follow the Federal Food and Drug Standards

* Taken from U.S.D.A. Handbook No. 51
Agricultural Marketing Service

RELATION OF BAUME TO TOTAL SOLIDS IN SWEETENED CONDENSED SKIM MILK

(Assuming a sucrose-in-water ratio of approximately 62%)

Baumé at 120°F.	Sucrose per cent	Serum Solids per cent	Total Solids per cent
37.4	45.63	27	72.63
37.6	45.00	28	73.00
37.8	44.38	29	73.38
38.0	43.75	30	73.75
38.2	43.13	31	74.13
38.4	42.50	32	74.50

Note: While the Baumé reading for total solids is approximately right, too much value should not be given this test for there may be considerable variation due to varying proportions of serum solids and sucrose (different types), and the amount of fat content, etc.

APPROXIMATE COMPOSITION AND WEIGHTS PER GALLON OF INGREDIENTS USED IN ICE CREAM MIX*

Ingredient	Per Cent Fat	Per Cent Serum Solids	Per cent Sufect	Per cent Total Solids	Weight per Gallon lb.
Water	0.00	0.00	0.00	0.00	8.3
Skim milk from 3.0% milk	0.00	8.60	0.00	8.60	8.7
Skim milk from 4.0% milk	0.00	9.00	0.00	9.00	8.7
Milk	3.00	8.33	0.00	11.33	8.6
Milk	4.00	8.79	0.00	12.79	8.6
Milk	5.00	9.10	0.00	14.10	8.6
Cream	12.00	7.80	0.00	19.80	8.5
Cream	15.00	7.57	0.00	22.57	8.5
Cream	18.00	7.31	0.00	25.31	8.5
Cream	20.00	7.13	0.00	27.13	8.5
Cream	25.00	6.68	0.00	31.68	8.4
Cream	30.00	6.24	0.00	36.24	8.4
Cream	35.00	5.69	0.00	40.69	8.4
Cream	40.00	5.35	0.00	45.35	8.3
Cream, frozen	50.00	4.45	0.00	54.45	8.2
Cream, plastic	80.00	1.80	0.00	81.80	
Butter, unsalted	84.00	1.00	0.00	85.00	
Butter oil	99.00	0.00	0.00	99.00	
Evaporated milk, canned	8.00	20.00	0.00	28.00	8.9
Evaporated milk, bulk	10.00	23.00	0.00	33.00	9.2
Sweetened condensed wholemilk	8.00	23.00	42.00	73.00	9.2
Condensed skim unsweetened	0.00	32.00	0.00	32.00	9.4
Condensed skim sweetened	0.00	27.00	42.00	69.00	9.2
Skim milk powder (non-fat dry milk solids)	0.00	97.00	0.00	97.00	
Whole milk powder	26.00	72.00	0.00	98.00	

* Courtesy of "Ice Creams and Other Frozen Desserts" — Frandsen & Nelson

WEIGHT PER GALLON OF FINISHED ICE CREAM, WITH VARIOUS WEIGHTS PER GALLON OF MIX, AND VARIOUS PERCENTAGES OF OVERRUN

		Percentage of Overrun															
110%	105%	100%	95%	90%	85%	80%	75%	70%	60%	50%	40%	30%	20%	15%	10%	5%	0%
lb	lb	lb	lb	lb	lb	lb	lb	lb	lb	lb	lb	lb	lb	lb	lb	lb	lb
8.5	580	547	515	500	486	475	460	448	433	427	417	407	398	388	380	372	365
9.00	600	565	529	514	500	486	474	463	450	439	429	419	409	400	391	385	375
9.25	617	578	544	529	514	500	485	474	462	451	440	430	420	411	402	395	385
9.50	633	591	559	543	528	514	500	497	475	463	452	441	432	422	413	401	396
9.75	650	609	574	557	542	527	513	500	487	476	461	455	445	435	421	415	400

SUGAR SYRUP CONCENTRATION, HOW TO MAKE AND CALCULATE BY USE OF THE BAUMÉ AND BRIX HYDROMETERS¹

Degrees Baumé ² M-145 68°F.	Degrees Brix 68°F.	Weight per gal. in air 68°F.	Pounds sugar per gal.	Pounds water per gal.
30.0	55.2	10.50	5.80	4.70
30.5	56.2	10.54	5.92	4.62
31.0	57.1	10.59	6.05	4.54
31.5	58.1	10.64	6.18	4.46
32.0	59.1	10.68	6.31	4.37
32.5	60.0	10.73	6.44	4.29
33.0	61.0	10.78	6.58	4.20
33.5	62.0	10.83	6.71	4.12
34.0	63.0	10.88	6.85	4.03
34.5	63.9	10.92	6.98	3.94
35.0	64.9	10.97	7.12	3.85
35.5	65.9	11.02	7.26	3.76
36.0	66.9	11.07	7.41	3.66
36.5	67.9	11.13	7.56	3.57
37.0	68.9	11.18	7.70	3.48
37.5	69.9	11.23	7.85	3.38
38.0	70.9	11.28	8.00	3.28
38.5	71.9	11.33	8.15	3.18
39.0	72.9	11.39	8.30	3.09
39.5	73.9	11.44	8.45	2.99
40.0	74.9	11.49	8.61	2.88

¹This table is based on information given in U. S. Bureau of Standards Circular No. 375 Table I.

²Baumé degree equals 145 minus 145 over Sp. Gr.

Specific Gravity equals 145 over 145 minus Baumé reading.

How To Use Above Table

EXAMPLE I. Required to make 50 gallons of 30° Baumé sugar syrup.

Formula: Read directly from the table the Baumé degree and the pounds of sugar and pounds of water needed to make 1 gallon of that degree syrup. Note also the weight per gallon of syrup. Multiply each of these amounts by the number of gallons to be made.

Solution (for 30° Baumé): $5.80 \times 50 = 290$ lb. sugar needed; $4.70 \times 50 = 235$ lb. water needed; $10.50 \times 50 = 525$ total weight in pounds of 50 gallons 30° Baumé syrup.

EXAMPLE II. To find the pounds of water required to dilute 1 gallon of 31° Baumé syrup to 30° Baumé syrup.

Formula:
$$\frac{(\text{lb. water per gal. diluted syrup}) \times (\text{lb. sugar per gal. original syrup})}{\text{lb. sugar per gal. diluted syrup}} - (\text{lb. water per gal. original syrup}) = \text{lb. water required.}$$

Solution: From the table substitute figures in the formula thus:

$$\frac{4.70 \times 6.85}{3.50} - 4.03 = 1.52 \text{ lb. water required to dilute 1 gallon 31° Baumé syrup}$$

to 30° Baumé For any larger quantity multiply 1.52 by the number of gallons to be diluted

EXAMPLE III To find the amount of sugar required to thicken 1 gallon 30° Baumé syrup to 34° Baumé

Formula: $\frac{(\text{lb sugar per gal thickened syrup}) \times (\text{lb water per gal original syrup})}{\text{lb water per gal thickened syrup}} - (\text{lb sugar per gal original syrup}) = \text{lb sugar to be added}$

Solution: From table substitute figures in the formula thus

$\frac{6.85 \times 4.70}{4.05} - 5.80 = 2.19$ lb sugar to be added to 1 gal 30° Baumé syrup to thicken it to 34° Baumé For any larger quantity multiply 2.19 lb by the number of gal to be thickened

Fountain Syrup Manufacture—Based On Size Of Batch Wanted

Baumé	1 Gallon Batch			10 Gallon Batch			
	Sugar	Water		Sugar	Water		
	Lb	Oz.		Lb	Oz.	Gal	Oz.
30°	5	13	72	58		5	80
31°	6		69	60	8	5	44
32°	6	5	67	63	8	5	52
33°	6	9½	64	66		5	
34°	6	14	60	69		4	06

Fountain Syrup Manufacture—Based On Use Of 100 Pounds of Sugar

Baumé Wanted 77°F.	Weight Sugar Taken	Amount Water To Add 77°F	Amount Syrup Made 77°F
31°	100 lb	6 gal 119 oz.	14 gal 61 oz.
33°	100 lb	7 gal 68 oz.	15 gal 8 oz.
32°	100 lb	8 gal 25 oz.	15 gal 84 oz.
31°	100 lb	8 gal 111 oz.	16 gal 47 oz.
30°	100 lb	9 gal 74 oz.	17 gal 10 oz.

Fountain Syrup Dilution—Based On Use Of One Gallon Of Syrup

EXAMPLE IV. Find Baumé of syrup wanted in extreme left hand column Read across to column beneath Baumé of syrup to be diluted The figure given is the amount of water, in fluid ounces, to be added to one gallon of syrup

Baumé of Syrup Wanted	Baumé of syrup to be diluted				
	30°	31°	32°	33°	34°
30°	—	6	11½	17½	23½
31°	—	—	6	11½	17
32°	—	—	—	5½	11
33°	—	—	—	—	5½

CREAMERY BUTTER PRODUCTION IN 1954 BY STATES*

	Pounds		Pounds
Maine	220,000	South Carolina	145,000
Vermont	2,888,000	Georgia	399,000
Massachusetts	331,000	Kentucky	17,197,000
New York	35,518,000	Tennessee	11,692,000
New Jersey	49,000	Mississippi	5,570,000
Pennsylvania	13,172,000	Arkansas	3,623,000
Ohio	64,314,000	Louisiana	323,000
Indiana	39,402,000	Oklahoma	30,148,000
Illinois	57,602,000	Texas	6,784,000
Michigan	51,887,000	Montana	6,405,000
Wisconsin	219,906,000	Idaho	32,079,000
Minnesota	272,093,000	Wyoming	2,247,000
Iowa	188,070,000	Colorado	16,526,000
Missouri	60,878,000	New Mexico	777,000
North Dakota	50,602,000	Utah	6,088,000
South Dakota	32,470,000	Nevada	557,000
Nebraska	78,198,000	Washington	21,998,000
Kansas	46,203,000	Oregon	17,885,000
Maryland	3,802,000	California	39,887,000
Virginia	6,981,000		
West Virginia	660,000		
North Carolina	2,582,000	United States	1,448,688,000

* Courtesy of Milk Industry Foundation

AMERICAN CHEESE PRODUCTION
BY STATES,* 1954**

	Pounds		Pounds
Vermont	5,003,000	Kentucky	33,225,000
New York	36,612,000	Tennessee	38,316,000
Pennsylvania	825,000	Alabama	3,246,000
Ohio	26,820,000	Mississippi	15,733,000
Indiana	27,760,000	Arkansas	13,068,000
Illinois	52,279,000	Louisiana	366,000
Michigan	31,187,000	Oklahoma	6,713,000
Wisconsin	480,979,000	Texas	5,204,000
Minnesota	63,324,000	Montana	4,472,000
Iowa	22,099,000	Idaho	22,455,000
Missouri	87,729,000	Colorado	2,448,000
South Dakota	2,723,000	Utah	7,662,000
Nebraska	449,000	Washington	3,496,000
Kansas	13,212,000	Oregon	24,845,000
Georgia	748,000	California	5,583,000
		United States	1,012,315,000

* Does not include full skim American.

Production of all other cheese excluding full skim American and Cottage Cheese in 1953 totaled 323 million pounds in addition to the figures above.

** Courtesy of Milk Industry Foundation

ICE CREAM PRODUCTION
IN 1934 BY STATES*

	Gallons		Gallons
Maine	349,000	West Virginia	4,001,000
New Hampshire	1,265,000	North Carolina	14,221,000
Vermont	1,425,000	South Carolina	2,500,000
Massachusetts	21,800,000	Georgia	7,551,000
Rhode Island	5,735,000	Florida	13,161,000
Connecticut	7,513,000	Kentucky	5,722,000
New York	61,779,000	Indiana	13,001,000
New Jersey	10,351,000	Alabama	7,956,000
Pennsylvania	60,557,000	Mississippi	3,415,000
Ohio	33,002,000	Arkansas	2,578,000
Indiana	20,514,000	Louisiana	8,001,000
Illinois	29,286,000	Oklahoma	1,152,000
Michigan	29,102,000	Texas	19,371,000
Wisconsin	19,505,000	Montana	2,479,000
Minnesota	15,502,000	Idaho	2,451,000
Iowa	12,530,000	Wyoming	703,000
Missouri	11,781,000	Colorado	5,823,000
North Dakota	19,200	New Mexico	1,206,000
South Dakota	2,000,000	Arizona	2,528,000
Nebraska	6,381,000	Utah	3,017,000
Kansas	6,901,000	Nevada	721,000
District of Columbia	5,031,000	Washington	9,500,000
Delaware	1,001,000	Oregon	5,584,000
Maryland	10,201,000	California	431,200,000
Virginia	10,664,000		

United States

596,000,000

* Courtesy of Milk Industry Foundation

LEADING COUNTIES IN VALUE OF
DAIRY PRODUCTS SOLD FROM FARMS, 1940†

County	Value of sales (1000 dollars)	Number of cows	Production per cow (pounds)
Los Angeles Calif	59,629	101,914	11,511
Stanislaus Calif	22,022	82,131	7,471
Dane Wis	18,501	87,067	6,920
Marathon Wis	17,174	89,301	6,101
St Lawrence N Y	16,775	82,131	5,487
Merced Calif	16,753	67,319	7,300
Lancaster Pa	16,657	58,267	6,771
Delaware N Y	10,262	61,201	6,253
Dodge Wis	15,700	73,002	7,217
Orange Calif	15,001	28,327	11,651
Oneida N Y	11,519	55,619	6,878
San Joaquin Calif	14,106	51,851	7,228
Clark Wis	13,978	72,030	6,186
Jefferson N Y	13,811	57,616	6,589
Fond du Lac Wis	13,720	60,766	7,376
Frederick Md.	13,002	41,284	6,400
San Bernardino Calif	13,011		
Sonoma Calif	12,579	40,146	7,024
Otsego N Y	12,222	49,732	6,356
Orange N Y	11,915	58,319	7,127
Tulare Calif	11,922	42,769	7,748
Barron Wis	11,790	55,142	6,629
Chenango N Y	11,520	47,932	7,017
Outagamie Wis	11,567	54,829	6,716
Chester Pa	11,329	37,259	6,362

* Latest figures available

† Courtesy of Milk Industry Foundation.

TOTAL MILK COWS ON FARMS DURING 1956 * †

Maine	112,000	West Virginia	186,000
New Hampshire	62,000	North Carolina	355,000
Vermont	286,000	South Carolina	148,000
Massachusetts	116,000	Georgia	305,000
Rhode Island	17,000	Florida	188,000
Connecticut	108,000	Kentucky	590,000
New York	1,365,000	Tennessee	628,000
New Jersey	147,000	Alabama	344,000
Pennsylvania	946,000	Mississippi	512,000
Ohio	843,000	Arkansas	342,000
Indiana	570,000	Louisiana	299,000
Illinois	780,000	Oklahoma	385,000
Michigan	800,000	Texas	758,000
Wisconsin	2,302,000	Montana	97,000
Minnesota	1,387,000	Idaho	215,000
Iowa	1,007,000	Wyoming	39,000
Missouri	849,000	Colorado	148,000
North Dakota	363,000	New Mexico	46,000
South Dakota	299,000	Arizona	46,000
Nebraska	422,000	Utah	101,000
Kansas	443,000	Nevada	14,000
Delaware	33,000	Washington	259,000
Maryland	237,000	Oregon	188,000
Virginia	390,000	California	850,000
United States		20,927,000	

* Excluding heifers 2 years old or over, approximately 2,100,000.

† Agricultural Marketing Service, U.S.D.A.

MILK PRODUCTION IN SPECIFIED COUNTRIES 1954*

Country	Milk Cows	Production Per Cow	Milk Production
	1,000 Head	Pounds	Million Pounds
Australia	2,251	5,857	13,184
Austria	1,164	4,641	5,401
Belgium	990	8,136	8,054
Canada	3,233	5,222	16,884
Denmark	1,506	7,900	11,898
France	9,182	4,450	40,860
Germany, Western	5,777	6,446	37,597
Netherlands	1,548	8,576	12,967
New Zealand	1,999	5,502	10,998
Norway	679	5,128	3,527
Sweden	1,542	6,248	9,634
Switzerland ¹	888	6,922	6,216
United States	22,406	5,512	123,702
United Kingdom	3,730	6,489	24,195

¹ Includes goat's milk.

* Courtesy of Milk Industry Foundation.

SCORE CARD

USDA

DAIRY FARM SANITATION REPORT*

(Approved by the American Dairy Science Association)

FARM NUMBER

DATE

TIME

AM

PM

OWNER

MILK GRADE

ADDRESS

NUMBER OF GALLONS DAILY

PERSON INTERVIEWED

DELIVERED TO

FACILITIES REQUIRED

(Indicate non-compliance by marking (X) in the appropriate boxes)

☐ 1 HEALTH OF COWS

Date

Tuberculin tested

Accredited

Brucellosis tested if required

Veterinary Examination if required

☐ 2 MILKING AREA

Housing & Milking

Barn?

Milking Barn or Parlor?

☐ 3 MILK HOUSE OR ROOM☐ 4 UTENSILS AND EQUIPMENT☐ 5 COOLING FACILITIES

Method Used

☐ 6 WATER SUPPLY☐ 7 TOILET AND SEWAGE DISPOSAL

SANITARY METHODS

(Indicate unsanitary conditions by marking (X) in the appropriate boxes. Add descriptive comments as necessary. See other side for grade & score instructions)

8 MILKING PROCEDURE

Was milking inspected? () yes

() no Method used (circle one)

hand pipeline machine

() Cows clean

() Udders washed

() Flanks udders and tails

clipped

() milkers hands clean

() clothes clean

Was Mastitis test used? () yes

() no Kind of test

() health of dairymen

() appearance of dairymen

() milk moved immediately to

milkroom

() abnormal milk not sold

Perfect

Score

Grade

20

9 MILKING AREA

() Walls and Ceiling clean

() Floors and gutter clean

() Free from other animals

() Free from flies

() Bedding ample and clean

() Manure removed daily

() Manure inaccessible to cows

() Barnyard clean

() Barnyard well drained

() Loose housing properly

maintained

15

10 MILK HOUSE OR ROOM

() Clean () Free from flies () Used for milk handling only

10

11 UTENSILS AND EQUIPMENT

() Clean

() Properly stored

() Approved procedure used for sanitizing utensils and milking machines

25

12. COOLING MILK

- () Temperature of cooling medium ____ °F. and/or milk ____ °F.
 () Milk delivered to plant at 50°F. or less or
 () Delivered to plant within 2 hours after milking if approved
 () Cooling medium sanitary

15

13. TOILET AND SEWAGE DISPOSAL

- () Sanitary maintenance () Sewage and Waste properly disposed

10

14. GENERAL PREMISES

- () Neat and clean

5

100

TOTAL SCORE -----

FARM RATING -----

SUPPLEMENTAL INFORMATION

(Based on last four records)

BACTERIAL COUNTS

Raw (Method _____)
 Thermogenic

TEMPERATURES**SANITATION SCORES****REMARKS**

Dairyman

Sanitarian

* Printed by courtesy of Dairy Cattle Research Branch, U.S.D.A., Beltsville, Maryland

Farm Classifications:**Milk for Bottling**

If a dairy farm fails to have any item under "1-7 inclusive," it shall not be admitted to the market for the major grade (usually Grade A) of bottled milk. A check on any item under this heading automatically requires re-inspection. Failure to make correction requires rejection of the milk for bottling until all items are brought into compliance. The dairy farm shall not be scored on Sanitary Methods unless items 1-7 inclusive are in compliance.

The farms are to be scored on each item 8 through 14 with the following grades and numerical scores:

Excellent (E) = 100 percent

Good (G) = 80 percent

Poor (P) = 60 percent

Unsatisfactory (U) = Zero

For example, a farm would receive 80 percent of 20 or 16 points on item 8 if compliance was judged good (G); 60 percent of 20 or 12 points for poor (P) compliance; and zero for unsatisfactory (U) compliance.

The scores shall be used to classify the farms as follows:

95 - 100

Excellent

80 - 94

Good

60 - 79

Re-inspect

59 or less

Immediate rejection

A score of 79 or less on re-inspection requires immediate rejection. The dairy shall be

brought into compliance before being reinstated

The sanitarian may call for a reinspection on the basis of several minor defects. Serious violation of any particular item may be considered grounds for exclusion

Milk for Manufacture

A dairy farm producing milk for manufacture into sweet cream, ice cream cottage and related cheese and dry and concentrated milks may be rated on this score report with these exceptions. Item 4 shall not require hot water and a wash vat in the milk room, Item 5 shall require facilities for cooling to 60°F or less Item f2, cooling to 60°F or less shall be deemed satisfactory. Since methods are just as important for milk for manufacture as milk for bottling the same system of scoring shall be used for it that is used for milk for bottling

Interpretation of Items on Dairy Farm Sanitation Report

FACILITIES REQUIRED

1 Health of Cows

Tuberculin Test The herd shall be free of tuberculosis as provided under the modified accredited area system approved by the Animal Disease Eradication Division Agricultural Research Service U S D A or as determined by annual tuberculin tests.

Brucellosis Test The herd shall be brucellosis tested and under an approved plan of eradication of the Animal Disease Eradication Division Agricultural Research Service, U S D A. In areas that do not require testing for brucellosis the local or state regulation on this item will be acceptable. It is recommended however that all areas adopt an approved plan of brucellosis control.

Evidence of the tuberculin and brucellosis tests shall be a certificate identifying each animal signed by the veterinarian and filed as directed by the regulatory officer.

Mastitis Program The strip cup or other approved test shall be used at each milking on each quarter. Abnormal milk or milk from suspicious or diseased quarters shall be discarded. When cows are treated for mastitis by infusion of the udder the milk from the treated quarter(s) shall be excluded from the supply for at least 72 hours after the last treatment. When diseased quarters are detected the affected cow shall be milked last or in such manner that infected milk will not contaminate the milking equipment that is used on the remainder of the healthy cows.

Apparent Health of the Herd The milking herd shall be observed closely for evidence of disease by the milker or owner and regulatory representative. When the evidence demonstrates that it is advisable the sanitarian may require an examination of the herd by a licensed veterinarian. The instructions of the veterinarian must be followed concerning isolation or segregation of sick animals.

2. Milking Area

A conventional milking barn or milking barn or parlor and loose housing or combined milking systems shall be provided. It shall be of such size and arrangement as to eliminate overcrowding, promote good health of the cows and carry on normal milking operations without impairing the quality of the milk. The milking area shall have watertight floors and gutters (constructed of concrete or equally satisfactory material) graded so as to drain properly and shall be kept in good repair. Walls and ceilings shall be reasonably smooth, tight, dustproof and covered with a material that is easily kept clean. Sufficient light (properly distributed) shall be provided for milking during the day or night. There shall be adequate ventilation for the health of the cows and to eliminate excessive odors and moisture. When conditions warrant a milking barn without four walls extending from floor to roof may be approved provided precautions are taken to prevent foul odors etc. from gaining entrance and provided adjacent areas are constructed and maintained so as not to have an adverse effect on the quality of the milk.

3 Milk House or Room

A milk house or room shall be provided in which the cooling, handling and storing of milk and milk products and the washing, bactericidal treatment and storing of milk containers and utensils, shall be done. It shall be of sufficient size to provide adequate unobstructed

working space and located convenient to or in the milking barn giving consideration to sanitation features. It shall not open directly into a room used for domestic purposes. The floor of the milk house shall be concrete or equally satisfactory material and constructed in such a manner that it will drain properly. The walls and ceilings shall be tight, smooth, and covered with a material that is easily kept clean. Sufficient light shall be provided to permit necessary operations day or night. Ventilation shall be provided to eliminate odors and excessive moisture in the milk house. All openings to the outside shall be screened. The floors, walls, ceilings, windows, doors, screens, and ventilation shall be kept in good order. All doors shall open outward only and be self-closing.

4. Utensils and Equipment

All multi-use containers, equipment, and other utensils used in the handling, storage, or transportation of milk or milk products shall be made of smooth, nonabsorbent, non-corrodible, nontoxic material, shall be so constructed as to be easily cleaned and shall be kept in good repair. Single-service strainer pads shall be used when milk is strained. All single-service articles used shall have been manufactured, packaged, transported, and handled in a sanitary manner.

Utensil Storage. All milk utensils shall be left in a treating chamber until used; or left in a bactericidal solution; or stored in the milkhouse or racks, in such a manner as to protect them from contamination, inverting such articles as can be inverted. Storage racks should be constructed of metal and protected against rust. Strainer pads, parchment papers, and gaskets shall be kept until used, in the original package with covers closed, or stored in a suitable container or cabinet and protected from contamination.

Washing Facilities. Sufficient hot water at a temperature of at least 120° F. shall be available in the milk house to wash utensils and equipment after each milking. A two-compartment wash vat shall be provided and used only for washing, rinsing, and bactericidal treatment of milk handling utensils and equipment.

5. Cooling Facilities

Mechanical refrigeration or cold well water is acceptable for cooling milk provided there is adequate capacity to cool the milk to 50°F. or less within 2 hours after completion of milking and for holding it at this temperature or lower until it is delivered. Where this requirement would work an undue hardship on producers and the supervising agency is assured that all of the uncooled milk would be delivered to the milk plant or receiving station within 2 hours after completion of milking, this item shall be deemed satisfied.

6. Water Supply

Water for all dairy purposes shall be from a supply properly located, protected, and operated, and shall be easily accessible, adequate, and of a safe, sanitary quality.

7. Toilet and Sewage Disposal

Every dairy farm shall be provided with one or more sanitary toilets, conveniently located, and properly constructed so that it can be properly operated and maintained to make the waste inaccessible to flies, to avoid pollution of the surface soil and contamination of any water supply.

SANITARY METHODS

8. Milking Procedure

The cows shall be free of visible dirt at the time of milking. If necessary, flanks, udders, and tails of cows should be clipped regularly to facilitate keeping the cows clean. Loose hair, dirt and extraneous material shall be removed from udders, teats, and flanks before milking. The strip cup or other approved test shall be used at each milking on each quarter. The fore milk in the strip cup and abnormal milk shall not be sold. Abnormal milk is milk from milk in the strip cup and abnormal milk shall not be sold. Abnormal milk is milk from cows treated with antibiotics within 72 hours, milk that is abnormal in appearance; and milk that is shown by the mastitis test to be abnormal. Also, milk shall be practically free from colostrum. The milk shall be carefully protected at all times. Straining is permitted in the barn only when the barn scores high on cleanliness, ventilation and freedom from flies and if straining is protected against contamination.

The appearance of the dairyman should be neat, his clothes clean and his personal habits such as to produce good quality milk. He should be apparently free from disease.

When sanitary conditions are questionable, the score on milking details must be obtained by inspection during the milking operation. It is recommended that as many inspections as possible be made during the milking operation.

9. Milking Barn

Walls and ceilings of the milking barn shall be reasonably free from foreign materials and dust. Floors and gutters to which cows have access shall be cleaned daily, preferably during the forenoon. Manure shall be removed and disposed of in such a manner as to be inaccessible to cows and to prevent breeding of flies. The milking barn shall be reasonably free of flies, Hogs, pigeons, poultry, and other objectionable animals shall be excluded from the milking barn. The barnyard shall be properly graded and drained to prevent the accumulation of muddy areas. Waste from pigpens, barns, and milk house shall not drain into the cow yard. Manure, soiled bedding, and waste feed may not be stored or permitted to accumulate in the loose housing area in such a manner as to permit the soiling of cows' udders and flanks, and it shall be maintained in such a manner that it provides a reasonably firm footing for the animals. Excessive accumulations of waste animal feed shall be considered a violation of this item.

10. Milk House or Room

The floors, walls, windows, shelves, tables, wash vats, and other milk room equipment shall be kept clean. The milk room shall be kept free of trash and articles not used in milk room work.

Approved insecticides or other effective fly-control measures shall be used to eliminate flies from the milk house. However, care must be taken to protect the milk and milk room equipment from contamination.

11. Utensils and Equipment

Containers, utensils, and equipment with which milk comes in contact during milking, straining, cooling, handling, storage, or transportation of milk shall be thoroughly cleaned after each usage. Cleanliness may be determined by sight, touch, or smell, by wiping with tissue or filter paper, and/or by other approved methods.

For storage of utensils see *Utensil Storage* under Item 4 above.

Sanitizing Utensils and Milking Machines. The application of any method or substance for the destruction of pathogens, and of other organisms as far as is practicable, which is effective and which does not adversely affect the equipment, the milk or milk products, or the health of the consumers shall be considered satisfactory compliance. All milk contact surfaces must be wetted by the bactericidal solution. Bactericidal sprays may be used for large equipment. Bactericidal treatment is not effective unless the surface has been thoroughly cleaned. Chemical solutions, once used shall not be reused for bactericidal treatment of utensils during subsequent milkings.

12. Cooling Milk

The milk must be delivered to the dairy plant at 56°F or less unless prior approval has been granted as outlined under Item 5. The cooling medium shall be kept clean and free from odor.

13. Toilet and Sewage Disposal

The toilet shall be operated and maintained so that the waste is inaccessible to flies and cows and does not pollute the surface so that it will contaminate any water supply. Waste from milk houses and other buildings shall be disposed of properly. There shall be no evidence of human excreta in the milking barn or areas adjacent thereto.

14. General Premises

The premises shall be neat and clean and maintained in such a manner that a consumer would have a favorable impression should he see or visit the dairy farm.

SPACE REQUIRED FOR STORING VARIOUS FEEDS*

Material	Weight per Cubic Foot in Pounds	Cubic Feet per Ton
Hay, loose in shallow mows	4	512
Hay, loose in deep mows	5	400
Hay, baled loose	10	200
Hay, baled tight	25	80
Hay, chopped long cut	8	250
Hay, chopped short cut	12	167
Straw, loose	4	512
Straw, baled	12	167
Silage, shallow	30	67
Silage, deep	50	40
Barley, 48 lb. per bu.	39	51
Corn, ear, 70 lb. per bu.	56	36
Corn, shelled, 56 lb. per bu.	45	44
Corn, cracked or corn meal, 50 lb. per bu.	40	50
Corn-and-cob meal, 45 lb. per bu.	36	56
Oats, 32 lb. per bu.	26	77
Oats, ground, 22 lb. per bu.	18	111
Oats, middlings, 48 lb. per bu.	39	51
Rye, 56 lb. per bu.	45	44
Wheat, 60 lb. per bu.	48	42
Soybeans, 62 lb. per bu.	50	40
Most concentrates	45	44

* Hoard's Dairyman (1951)

AVERAGE WEIGHTS OF DIFFERENT FEEDING STUFFS*

Feeding Stuff	One Quart Weights	One Pound Measures
Barley Meal	1.1 lb.	0.9 qt.
Barley, whole	1.5 lb.	0.7 qt.
Brewer's dried grains	0.6 lb.	1.7 qt.
Corn-and-cob meal	1.4 lb.	0.7 qt.
Corn bran	0.5 lb.	2.0 qt.
Corn meal	1.5 lb.	0.7 qt.
Corn, whole	1.7 lb.	0.6 qt.
Cottonseed meal	1.5 lb.	0.7 qt.
Distillers' grains, dried	0.5-0.7 lb.	1.0-1.4 qt.
Germ-oil meal	1.4 lb.	0.7 qt.
Gluten feed	1.3 lb.	0.8 qt.
Gluten meal	1.7 lb.	0.6 qt.
Hominy meal	1.1 lb.	0.9 qt.
Linseed meal (n.p.)	0.9 lb.	1.1 qt.
Linseed meal (o.p.)	1.1 lb.	0.9 qt.
Malt sprouts	0.6 lb.	1.7 qt.
Oats, ground	0.7 lb.	1.4 qt.
Oats, whole	1.0 lb.	1.0 qt.
Rye meal	1.5 lb.	0.7 qt.
Rye, whole	1.7 lb.	0.6 qt.
Wheat bran	0.5 lb.	2.0 qt.
Wheat, ground	1.7 lb.	0.6 qt.
Wheat middlings flour	1.2 lb.	0.8 qt.
Wheat middlings, standard	0.8 lb.	1.3 qt.
Wheat, whole	1.9 lb.	0.5 qt.

Note: 2150-42 cubic inches equal one bushel; 67.2 cubic inches equal one quart dry measure.

* (Farmers' Bul. 222)

RECOMMENDED DAILY ALLOWANCES FOR DAIRY CATTLE**

(Based on Air-Dry Feed Containing 90 Per cent Dry Matter)

Body Weight, pounds	Expected Gain		Daily Allowances per Animal*					Vita min D, I U
	Small Breeds, pounds	Large Breeds, pounds	Total Feed, pounds	Digestible Protein, pounds	I D N, pounds	Calcium, grams	Phosphorus, grams	Carotene, milk grams
Normal Growth of Dairy Heifers								
50	0.5		0.9	0.20	1.0	4	3	6†
100	1.0	0.8	2.0	0.40	2.0	8	6	0
150	1.3	1.4	4.0	0.50	3.0	12	8	9
200	1.4	1.6	6.0	0.60	4.0	16	11	12
300	1.2	1.3	11	0.80	6.5	20	15	24
400	0.8	1.4	15	0.85	8.5	18	15	36
600	1.1	1.2	19	0.90	10.0	16	15	48
800	-	1.3	22	0.95	11.0	15	15	60
1000	-	1.2	24	1.00	12.0	15	15	72
1200	-	-	-	-	-	-	-	-
Maintenance of Mature Cows†								
800	-	-	14	0.50	6.8	8	8	48
1000	-	-	16	0.60	8.0	10	10	60
1200	-	-	18	0.70	9.2	12	12	72
1400	-	-	21	0.80	10.5	14	14	84
1600	-	-	23	0.87	11.4	16	16	96
Reproduction (Add to Maintenance During Last 2 to 3 Months)								
20	2.0	8.0	6.0	0.60	12	7	30	†

Lactation (Add to Maintenance for each Pound of Milk)						
3.0% fat	0.040	0.28	1	0.7		
4.0% fat	0.045	0.32	1	0.7		
5.0% fat	0.050	0.37	1	0.7		
6.0% fat	0.055	0.42	1	0.7		
Maintenance of Breeding Bulls						
1200	18	1.00	10.3	12	12	72
1600	22	1.20	12.9	16	16	96
2000	27	1.45	15.6	20	20	120
2400	31	1.60	18.2	24	24	144

*Thiamine, riboflavin, niacin, pyridoxine, pantothenic acid, and vitamin K are synthesized by bacteria in the rumen, and it appears that adequate amounts of these vitamins are furnished by a combination of rumen synthesis and natural feedstuffs. Manganese iron copper and cobalt are clearly essential but the amounts needed are not known. For growth, 0.6 gm. magnesium is needed per 100 pounds of body weight.

†Calves should receive colostrum the first few days after birth, as a source of vitamin A and other essential factors.

‡While vitamin D is known to be required, the data are inadequate to warrant specific figures for older growing animals and for maintenance, reproduction, and lactation. The vitamin D allowance has been increased from 300 to the present 400 I.U. per 100 pounds body weight to provide a safety margin comparable to that of other nutrients.

§When calculating the allowances for lactating heifers that are still growing, it is recommended that the figure for growth rather than maintenance be used.

|| When adequate amounts of vitamins A and D are fed for normal reproduction, extra amounts will probably not stimulate milk production but will increase the vitamin content of the milk.

•• Recommended Nutrient Allowances for Dairy Cattle. Natl. Research Council, 1950.

"Dairy Cattle" by Henderson and Reeves
(Courtesy of John Wiley and Sons)

SILOS — SIZE AND CONTENTS TABLE

Capacity (in Tons) of Silos of Various Diameters and Depths†

Capacity (in Tons) of Silos of Various Diameters										
Depth* feet	Average weight per cubic foot, † pounds	If the inside diameter, in feet, is								
		10	11	12	13	14	15	16	17	18
		Then the area in square feet and the volume in cubic feet per foot of depth is								
		78.5	95.0	113.1	132.7	153.9	176.7	201.0	226.9	254.5
And the number of tons of silage is										
1	17.7	0.7	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2
2	23.5	1.8	2.2	2.6	3.1	3.6	4.1	4.7	5.8	6.0
3	26.9	3.2	3.9	4.6	5.3	6.2	7.1	8.1	9.2	10.3
4	29.5	5	6	7	8	9	10	12	13	15
5	31.6	6	7	9	10	12	14	16	18	20
6	33.3	8	9	11	13	15	17	20	23	26
7	34.7	10	12	14	16	19	21	24	27	31
8	36.0	11	13	16	19	22	25	29	33	37
9	37.1	13	16	19	22	26	30	34	38	43
10	38.1	15	18	22	25	29	33	38	43	49
11	39.0	17	20	24	28	33	38	43	49	55
12	39.8	19	23	27	32	37	42	48	54	61
13	40.6	21	25	30	34	41	47	53	60	67
14	41.2	23	28	33	38	44	51	58	66	74
15	41.8	25	30	36	42	48	55	63	71	80
16	42.4	27	32	38	45	52	60	68	77	86
17	43.0	29	35	41	48	56	64	73	83	93
18	43.5	31	37	44	52	60	69	79	89	100
19	43.9	33	40	47	55	64	74	84	95	106
20	44.3	35	42	50	59	68	78	89	101	113
21	44.7	37	45	53	62	72	83	94	107	120
22	45.1	39	47	56	66	76	88	100	113	126
23	45.5	41	50	59	70	81	93	105	119	133
24	45.8	43	52	62	73	85	98	111	125	140
25	46.1	45	55	65	77	89	102	116	131	147
26	46.4	47	57	68	80	93	107	121	137	154
27	46.7	50	60	71	83	97	112	127	143	161
28	46.9	52	62	74	87	101	116	132	149	167
29	47.2	54	65	77	90	105	121	138	155	174
30	47.4	56	68	81	95	110	126	143	161	181
31	47.7	58	70	84	98	114	131	149	168	188
32	47.9	60	73	87	102	118	135	154	174	195
33	48.1	62	75	90	105	122	140	160	180	202
34	48.3	65	78	93	109	126	145	165	186	209
35	48.5	67	81	96	113	131	150	171	193	216
36	---	---	---	---	---	135	155	176	199	223
37	---	---	---	---	---	139	160	182	205	230
38	---	---	---	---	---	143	164	187	211	237
39	---	---	---	---	---	148	170	193	218	244
40	---	---	---	---	---	152	174	198	224	251
41	---	---	---	---	---	---	---	204	230	258
42	---	---	---	---	---	---	---	209	236	265
43	---	---	---	---	---	---	---	215	243	272
44	---	---	---	---	---	---	---	220	249	279
45	---	---	---	---	---	---	---	226	255	286
46	---	---	---	---	---	---	---	---	---	293
47	---	---	---	---	---	---	---	---	---	300
48	---	---	---	---	---	---	---	---	---	307
49	---	---	---	---	---	---	---	---	---	314
50	---	---	---	---	---	---	---	---	---	321

* Measured from top of settled silage before any silage was removed.

† All silage down to depth indicated in Column 1

‡ From "FARM BUILDINGS" by Carter—Reprinted with permission of John Wiley & Sons, Inc., Publishers.

BREEDING RECORD

NAME OF COW	DATE		REMARKS—Name of Bull Bred to, Etc.
	Bred	Due	

Successful dairymen keep careful written records of breeding dates. Such data often proves of the greatest importance. It provides information without which application for registry blanks cannot be filled out. Such records provide definite knowledge as to just when cows may be expected to freshen, making it possible to give cows the proper care at the crucial time. Blanks can be made as long or as short as needed for herd.

INTERNATIONAL UNITS (I.U.) OF VITAMINS

Vitamin A

1 I.U. = 1 USP unit = that amount of vitamin A activity contained in 0.344 micrograms of crystalline vitamin A acetate or 0.30 micrograms of vitamin A, alcohol.

Provitamin A: beta-carotene

1 I.U. = that amount of activity contained in 0.6 micrograms of International standard beta-carotene.

Vitamin B₁:thiamine hydrochloride

1 I.U. = 1 USP unit = the B₁ activity of 3.0 micrograms of crystalline thiamine hydrochloride. Original standard was a particular sample of an adsorption product on fullers' earth of an extract of rice polishings; the unit was the activity of 0.01 gm. of this preparation.

Vitamin C: ascorbic acid

1 I.U. = 1 USP unit = the vitamin C activity of 0.05 mg. of L-ascorbic acid. The original unit, approximately equal in activity, was 0.1 ml. of the freshly expressed juice of the lemon, *Citrus limonum*.

Vitamin D (for humans and four-footed animals)

1 I.U. = 1 USP unit = vitamin D activity of 0.025 micrograms of crystalline vitamin D₂ (calciferol).

Vitamin E: alpha-tocopherol

1 I.U. = 1 USP unit = the vitamin E activity of 0.1 gm. of the International Standard solution, containing 1.0 mg. of synthetic racemic alpha-tocopherol acetate.

Other vitamins

The activity of other vitamins is expressed as the weight in milligrams or micrograms of the various chemically pure materials.

CALIBRATION OF BABCOCK GLASSWARE

The accuracy of glassware for the Babcock test is determined by using water, alcohol or mercury for determining the weight or delivery capacity. Various types of plunger displacement devices are also used for this work.

The neck of the Babcock bottle for testing milk for fat is graduated to read from 0 to 8% with 0.1% graduations and has a capacity of 1.6 ml. All methods for checking the accuracy of the bottle involve the determination of the range in capacity above or below 1.6 ml. in the 8% graduated section.

The limit of variability must be within the smallest graduations on the bottle which represents 0.1% in the milk-test bottle, and 0.5% in the cream-test bottle. The brass plunger and the Nafis mercury insertion methods are most commonly used by the manufacturers and those responsible for officially checking the accuracy of Babcock test bottles.

Babcock Test Bottles

Mercury and Cork Method: Apparatus, Cork; Reagent, Mercury.

Procedure

1. Test bottles must be clean and dry. Temperature of mercury, bottle, and room should be 68° F, 20° C.

Weigh 2.70942 gm. of clean dry mercury into the bottle for each per cent of graduation in the neck of the bottle.

Weigh 27.0942 gm. into a 10% bottle and 21.6754 gm. into an 8% bottle. For a 9 gm. 50% cream bottle the charge is one half of 2.70942 or 1.3547 gm. for each per cent or $50 \times 1.3547 = 67.735$ gm.

2. Insert cork or rubber stopper to exactly the highest graduation mark on the bottle.

3. Invert bottle and observe the level of the mercury column at the top of the meniscus.

Interpretation

If bottle is correct the mercury will be exactly at the zero mark. Care must be taken not to lose any of the mercury.

(Courtesy of LABORATORY MANUAL published by Milk Industry Foundation)

THE FREEZING POINT RELATIONSHIPS OF CALCIUM CHLORIDE BRINE

<i>Per Cent</i>						
<i>Per Cent</i>	<i>Calcium</i>					
<i>Calcium</i>	<i>Chloride</i>	<i>Specific</i>	<i>Weight</i>			
<i>Chloride</i>	<i>Hydrous</i>	<i>Gravity</i>	<i>Per</i>	<i>Degrees</i>	<i>Degrees</i>	<i>Freezing</i>
<i>Anhydrous</i>	<i>CaCl 6H₂O</i>	<i>18/4 C</i>	<i>Gallon</i>	<i>Baumé</i>	<i>Salometer</i>	<i>Point</i>
						<i>Degrees F</i>
1	1.98	1.0070	8.41	1.0	4	31.6
2	3.96	1.0154	8.45	2.2	8	31.3
3	5.91	1.0239	8.51	3.4	12	30.6
4	7.92	1.0319	8.61	4.5	16	29.8
5	9.90	1.0409	8.67	5.7	22	28.9
6	11.88	1.0495	8.75	6.8	26	27.9
7	13.86	1.0582	8.82	8.0	32	26.8
8	15.84	1.0660	8.89	9.0	36	25.5
9	17.82	1.0757	8.96	10.2	40	24.3
10	19.80	1.0847	9.04	11.3	44	22.8
11	21.78	1.0937	9.12	12.4	48	21.6
12	23.76	1.1029	9.19	13.5	52	20.1
13	25.74	1.1121	9.28	14.6	58	18.3
14	27.72	1.1214	9.35	15.7	62	16.7
15	29.70	1.1307	9.42	16.8	68	14.7
16	31.68	1.1402	9.50	17.8	72	12.9
17	33.66	1.1497	9.58	18.9	76	10.8
18	35.64	1.1591	9.67	19.9	80	8.4
19	37.62	1.1692	9.75	21.0	84	5.5
20	39.60	1.1791	9.83	22.0	88	2.7
21	41.58	1.1890	9.91	23.1	92	-0.6
22	43.56	1.1990	10.00	24.1	96	-4.4
23	45.51	1.2090	10.08	25.1	100	-8.3
24	47.52	1.2192	10.16	26.0	104	-13.2
25	49.50	1.2291	10.24	27.1	108	-18.8
26	51.48	1.2398	10.34	28.1	112	-25.1
27	53.46	1.2503	10.42	29.0	116	-32.8
28	55.44	1.2610	10.51	30.0	120	-42.2
29	57.42	1.2718	10.60	31.0	124	-54.4
29.8	58.80	1.2801	10.67	31.8	128	-67.0

SODIUM CHLORIDE (SALT) SOLUTION

Degrees Raumé at 60°F.	Specific Gravity at 39°F.	Degrees Salomér at 60°F.	Salt per Gallon of Solution lb.	Salt per Cubic Foot lb.	Salt by Weight %	Freez- ing Point degree F.	Specific Heat*	Weight Per Gallon At 39°F. lb.
1	1.007	4	0.081	0.628	1	31.8	0.992	8.40
2	1.015	8	0.169	1.264	2	29.3	0.984	8.46
3	1.023	12	0.256	1.914	3	27.8	0.976	8.53
4	1.030	16	0.344	3.573	4	26.6	0.968	8.59
5	1.037	20	0.433	3.238	5	25.2	0.960	8.65
6	1.045	24	0.523	3.912	6	23.9	0.946	8.72
7	1.053	28	0.617	4.615	7	22.5	0.932	8.78
8	1.061	32	0.708	5.295	8	21.2	0.919	8.85
9	1.068	36	0.802	5.998	9	19.9	0.905	8.91
10	1.076	40	0.897	6.709	10	18.7	0.892	8.97
12	1.091	48	1.092	8.168	12	16.0	0.874	9.10
15	1.115	60	1.389	10.389	15	12.2	0.855	9.26
20	1.155	80	1.928	14.421	20	6.1	0.829	9.64
24	1.187	96	2.376	17.772	24	1.2	0.795	9.90
25	1.196	100	2.488	18.610	25	+ 0.5	0.783	9.97
26	1.204	104	2.610	19.522	26	- 1.1	0.771	10.04

*Specific Heat: The ratio between the amount of heat required to raise a given weight of substance to a given temperature and the amount of heat required to raise the same amount of water to the same temperature.

COMPARISON OF THERMOMETER READINGS

<i>Cent</i>	<i>Fahr</i>	<i>Cent</i>	<i>Fahr</i>	<i>Cent</i>	<i>Fahr.</i>
-40	-40.0	21	69.8	62	143.6
-38	-36.4	22	71.6	63	145.4
-36	-32.8	23	73.4	64	147.2
-34	-29.2	24	75.2	65	149.0
-32	-25.6	25	77.0	66	150.8
-30	-22.0	26	78.8	67	152.6
-28	-18.4	27	80.6	68	154.4
-26	-14.8	28	82.4	69	156.2
-24	-11.2	29	84.2	70	158.0
-22	- 7.6	30	86.0	71	159.8
-20	- 4.0	31	87.8	72	161.6
-18	- 0.4	32	89.6	73	163.4
-16	+ 3.2	33	91.4	74	165.2
-14	6.8	34	93.2	75	167.0
-12	10.4	35	95.0	76	168.8
-10	14.0	36	96.8	77	170.6
- 8	17.6	37	98.6	78	172.4
- 6	21.2	38	100.4	79	174.2
- 4	24.8	39	102.2	80	176.0
- 2	28.4	40	104.0	81	177.8
0	32.0	41	105.8	82	179.6
+ 1	33.8	42	107.6	83	181.4
2	35.6	43	109.4	84	183.2
3	37.4	44	111.2	85	185.0
4	39.2	45	113.0	86	186.8
5	41.0	46	114.8	87	188.6
6	42.8	47	116.6	88	190.4
7	44.6	48	118.4	89	192.2
8	46.4	49	120.2	90	194.0
9	48.2	50	122.0	91	195.8
10	50.0	51	123.8	92	197.6
11	51.8	52	125.6	93	199.4
12	53.6	53	127.4	94	201.2
13	55.5	54	129.2	95	203.0
14	57.2	55	131.0	96	204.8
15	59.0	56	132.8	97	206.6
16	60.8	57	134.6	98	208.4
17	62.6	58	136.4	99	210.2
18	64.4	59	138.2	100	212.0
19	66.2	60	140.0		
20	68.0	61	141.8		

HEAT-TRANSFER VALUES OF SOME COMMON MATERIALS

METALS

Material	k^* (constant)
Aluminum	118
Brass, yellow	55
Copper	238
Iron, wrought	40
Iron, cast	36
Lead	20
Nickel	32
Steel	25
Tin	35
Zinc	64

NON-METALS

Asbestos	0.12
Brick, building (1,800°F.)	0.80
Brick, Sil, Cel (1,800°F.)	0.03
Brick and mortar wall	0.40
Cement, Portland	0.50
Cork	0.03
Glass, Flint	0.30
Magnesia	0.04
Rubber	0.10
Wood, pine, parallel to fiber	0.07

GASES

Air	0.0137	at 32° F.
Carbon monoxide	0.0131	at 32° F.
Carbon dioxide	0.00804	at 32° F.
Oxygen	0.0138	at 32° F.
Nitrogen	0.0137	at 32° F.
Steam	0.0129	at 212°F.

LIQUIDS

Water	0.347	at 86° F.
	0.372	at 167°F.

* Equals B.t.u. per hour per square foot per degree Fahrenheit per foot thickness.
A. W. Farrell— "Dairy Engineering"

WEIGHTS AND MEASURES

Avoirdupois Weight

- 1 grain or minim = smallest unit
 27 34375 grains = 1 drachm (dram)
 16 drams = 1 ounce
 16 ounces = 1 pound = 7000 grains
 2000 pounds = 1 ton
 2240 pounds = 1 long ton

Apothecaries' Weight

- 20 grains or minims = 1 scruple
 3 scruples = 1 dram
 8 drams = 1 ounce
 12 ounces = 1 pound = 5760 grains

Troy Weight (Used by Jewelers)

- 24 grains = 1 pennyweight
 20 pennyweights = 1 ounce
 12 ounces = 1 pound
 The ounce and pound are the same as in Apothecaries' weight

Metric (Mass) Weight

- 10 milligrams = 1 centigram
 10 centigrams = 1 decigram
 10 decigrams = 1 gram (gm)
 10 grams = 1 decagram
 10 decagrams = 1 hectogram
 10 hectograms = 1 kilogram (1000 gms)
 10 kilograms = 1 myriagram
 10 myriagrams = 1 quintal
 10 quintals = 1 metric ton (1000000 gms or 1 cu meter = 22016 lb)

Liquid Measure (Capacity or Volume)

- 60 minims = 1 dram
 8 drams = 1 ounce
 16 ounces (4 gills) = 1 pint
 2 pints = 1 quart
 4 quarts = 1 gallon (231 cu in)
 31½ gallons = 1 barrel
 2 barrels = 1 hoghead
 1 teaspoonful = ½ oz (1½ dram U S meas tsp)
 1 tablespoonful = ½ oz. (3 tsp)
 1 standard measuring cup = 8 or or 16 tablespoonfuls

Metric Liquid Measure*

- 10 milliliters (ml) = 1 centiliter
 10 centiliters = 1 deciliter
 10 deciliters = 1 liter (1000 ml)
 10 liters = 1 decaliter
 10 decaliters = 1 hectoliter
 10 hectoliters = 1 kiloliter or stere
 * Metric dry measure can be expressed in cubic centimeters (cc)

Quick Reference Table U. S. Liquid Measure

Shows the number of smaller units of measure contained in each larger standard measure

Gallon		Quart		Pint		Ounce		Tb'sps		Teasps	
Quarts	4	Quart	2	Pint	16	Ounce	2	Tb'sps	3	Teasps	80
Pints	8				32						
Ounces	128				64						
Tablespoons	256				96						
Teaspoons (U.S.)	768				480						
Drops	61440				15360						

U. S. Standard Dry Measure.

- 33.6 cu inches = 1 pint
 2 pints = 1 quart
 4 quarts = 1 gallon (268.8 cu in)
 2 gallons (8 qts) = 1 peck
 4 pecks = 1 bushel
 3½ bushels = 1 chaldron

U. S. Linear Measure (length)

- 12 inches = 1 foot
 3 feet = 1 yard
 5½ yards = 1 rod
 320 rods (5280 ft.) = 1 mile (statute)

Metric Linear Measure

10 Angstrom units = 1 millimicron
 1,000 millimicrons = 1 micron
 1,000 microns = 1 millimeter
 10 millimeters = 1 centimeter (cm.)
 10 centimeters = 1 decimeter

10 decimeters = 1 meter
 10 meters = 1 decameter
 10 decameters = 1 hectometer
 10 hectometers = 1 kilometer
 (0.62137 mile)

U. S. Standard Square Measure (Area)

144 sq. inches = 1 sq. foot
 9 sq. ft. = 1 sq. yard
 30¼ sq. yds. = 1 sq. rod

160 sq. rds. = 1 acre
 43,560 sq. ft. = 1 acre
 640 acres = 1 sq. mile

Circular Measure

60 seconds = 1 minute
 60 minutes = 1 degree

360 degrees = 1 circle

Conversion Equivalents—Weight

1 grain (Avoir.) = 0.0648 grams
 1 scruple (Apoth.) = 1.296 gms.
 1 ounce (Avoir.) = 28.3491 gms.
 1 ounce (Troy) = 31.103 gms.
 1 lb. (Avoir.) = 0.4536 kilograms
 1 lb. (Troy) = 0.3729 kilograms

1 gram = 15.432 grains
 1 gram = 0.772 scruples (Apoth.)
 1 gram = 0.035 ounce (Avoir.)
 1 gram = 0.032 ounce (Troy)
 1 kilogram = 2.20462 lb. (Avoir.)
 1 kilogram = 2.679 lb. (Troy)

Capacity

1 cu. in. = 16.4 cc.
 1 U.S. minim = 0.0616 milliliter
 1 U.S. dram = 3.697 ml. or cc.*
 1 U.S. teaspoon = 4.9 ml. or cc.
 (1½ drams)
 1 U.S. fluid oz. = 29.573 ml. or cc.
 1 U.S. liquid qt. = 0.946 liters
 1 U.S. gallon = 3.785 liters
 1 U.S. dry qt. = 1.101 liters
 1 cu. in. = 16.4 cu. centimeters
 1 liter = 1000 milliliters or 1000
 cubic centimeters

1 cu. ft. water = 7.43 gals. = 62½ lb.
 231 cu. in. = 1 gal.
 1 U.S. bushel = 0.3524 hectoliters
 1 ml.* or 1 cc. = 0.061 cu. in.
 1 ml. or 1 cc. = 16.228 minims
 1 ml. or 1 cc. = 0.2705 drams
 1 ml. or 1 cc. = 0.034 U.S. fl. oz.
 1 liter = 1.05668 U.S. liquid qt.
 1 liter = 0.264 U.S. gallon
 1 hectoliter = 2.838 U. S. bu.
 1 liter = 0.908 U.S. dry qt.
 1 cu. centimeter = .061 cu. in.

* For practical purposes 1 milliliter equals 1 cubic centimeter (cc.)

Length

1 inch = 2.5400 centimeters (cm.)
 1 foot = 0.3048 meters or 30.480 cm.
 1 yard = 0.9144 meters or 91.4401 cm.
 1 mile = 1.609 kilometers
 1 fathom = 6 feet
 1 knot = 6.086 feet

1 cm. = 0.3937 inch
 1 cm. = 0.0328 ft.
 1 meter = 1.09361 yds.
 1 kilometer = 0.621 mile
 3 knots = 1 league

Determining the Capacity of Circular Containers

To find the area of a circle multiply the square of its radius* by 3.1416—

Thus: Radius² × 3.1416 = area in square feet

* Radius = ½ the diameter.

To find the number of cubic feet or volume of a circular bin, silo or tank multiply the area of its base (area of circle) by its length or height—Thus: Radius² × 3.1416 × height = cubic footage. Ex.—The diameter of a silo is 16 ft. Its height 32 ft. What is its cubic footage or volume?—8 × 8 × 3.1416 × 32 = 6431 cubic feet. To find the capacity in bushels of grain, multiply its volume by ¼. If ear corn multiply by ⅔.

Finding the Capacity of Square or Oblong Bins or Cribs

Multiplying the length in feet by the width by the height, gives the cubic footage. Capacity in bushels of grain = cubic footage multiplied by 4 and divided by 5. For ear corn multiply by 2 and divide by 5.

METAL COEFFICIENTS OF LINEAR EXPANSION AT TEMPERATURES BETWEEN 32° AND 212° F.

Material	For 1° C	For 1° F	Material	For 1° C	For 1° F
Aluminum—cast	0.0000222	0.0000123	Steel—untempered	0.0000108	0.0000060
Aluminum—rolled	0.0000207	0.0000115	Steel—tempered	0.0000126	0.0000070
Antimony	0.0000110	0.0000061	Tin	0.0000207	0.0000115
Bismuth	0.0000139	0.0000077	Zinc	0.0000288	0.0000160
Brass	0.0000189	0.0000105	Brick, best stock	0.0000055	0.0000031
Copper	0.0000171	0.0000095	Fire brick	0.0000019	0.0000027
Gold	0.0000153	0.0000083	Building stones		
Iron—cast	0.0000108	0.0000060	from	0.0000072	0.0000040
Iron—wrought	0.0000117	0.0000065	to	0.0000114	0.0000080
Lead	0.0000284	0.0000158	Glass	0.0000088	0.0000049
Nickel	0.0000126	0.0000070	Porcelain	0.0000056	0.0000030
Platinum	0.0000087	0.0000048	Slate	0.0000104	0.0000058
Silver	0.0000198	0.0000110			

A. W. FARRALL — DAIRY ENGINEERING

COMMON NAMES OF COMPOUNDS, THEIR CHEMICAL NAMES AND FORMULAS

Common Name	Chemical Name	Formula
Alum	General refers to potassium aluminum sulfate	$K_2Al_2(SO_4)_3 \cdot 24H_2O$
Alum flour		
Alum meal		
Alumina	Aluminum oxide	Al_2O_3
Aqua fortis	Nitric acid	HNO_3
Aspirin	Acetyl-salicylic acid	$C_9H_8(O_2)_2$
Bakelite	Resin from phenol + formaldehyde	
Baking soda	Sodium bicarbonate	$NaHCO_3$
Barium white	Barium sulfate	$BaSO_4$
Bauxite	Hydrated alumina	$Al_2O_3 \cdot 2H_2O$
Beet Sugar	Sucrose	$C_{12}H_{22}O_{11}$
Bleaching powder	Calcium chloro hypochlorite	$CaOCl_2$
Blue copperas	Copper sulfate	$CuSO_4 \cdot 5H_2O$
Blue stone		
Blue vitriol		
Boric acid	Boric acid	H_3BO_3
Borax	Sodium tetraborate	$Na_2B_4O_7 \cdot 10H_2O$
Brimstone	Sulfur	S
Burnt alum	Anhydrous potassium aluminum sulfate	$K_2Al_2(SO_4)_3$
Burnt lime	Calcium oxide	CaO
Cane sugar	Sucrose	$C_{12}H_{22}O_{11}$
Carbolic acid	Phenol	C_6H_5OH
Carbonic acid	Carbon dioxide	CO_2
Carbonic anhydride		
Carborundum	Silicon carbide	SiC
Caustic	Refers to the hydroxide of a metal	

<i>Common Name</i>	<i>Chemical Name</i>	<i>Formula</i>
Chalk	Calcium carbonate	CaCO_3
Chili niter	Sodium nitrate	NaNO_3
Chili saltpeter		
Chloramine T	Sodium p-toluene-sulfochloramide	$(\text{CH}_3\text{C}_6\text{H}_4\text{SO}_2\text{NCINa}) \cdot 3\text{H}_2\text{O}$
Chloride of lime	Calcium chloro-hypochlorite	CaOCl_2
Chloride of soda	Sodium hypochlorite solution	NaOCl
Chrome alum	Potassium chromium sulfate	$\text{K}_2\text{Cr}_2(\text{SO}_4)_4 \cdot 24\text{H}_2\text{O}$
Copperas	Ferrous sulfate	$\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$
Common salt	Sodium chloride	NaCl
Corn Sugar	Glucose	$\text{C}_6\text{H}_{12}\text{O}_6 \cdot \text{H}_2\text{O}$
Corrosive sublimate	Mercuric chloride	HgCl_2
Cream of tartar	Potassium hydrogen tartrate	$\text{KHC}_4\text{H}_4\text{O}_6$
Dextrose	Glucose	$\text{C}_6\text{H}_{12}\text{O}_6 \cdot \text{H}_2\text{O}$
Epsom salts	Magnesium sulfate	$\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$
Feldspar	Potassium aluminum silicate	$\text{K}_2\text{Si}_2\text{O}_7 \cdot \text{Al}_2\text{Si}_2\text{O}_7$
Ferro prussiate	Potassium ferrocyanide	$\text{K}_4\text{Fe}(\text{CN})_6$
Flowers of sulfur	Sulfur	S
Formalin	Forty per cent solution of formaldehyde in water	HCHO
Freezing salt	Crude sodium chloride	NaCl
Fuller's earth	Hydrated magnesium and aluminum silicates
Fusel oil	Mixed amyl alcohols	$\text{C}_4\text{H}_{11}\text{OH}$
Casoline	Benzine, petrol
Clauber's salt	Sodium sulfate	$\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$
Glucose	Dextrose	$\text{C}_6\text{H}_{12}\text{O}_6 \cdot \text{H}_2\text{O}$
Glycerin	Glycerol	$\text{C}_3\text{H}_8(\text{OH})_3$
Grain alcohol	Ethyl alcohol	$\text{C}_2\text{H}_5\text{OH}$
Grape sugar	Glucose	$\text{C}_6\text{H}_{12}\text{O}_6 \cdot \text{H}_2\text{O}$
Green vitriol	Ferrous sulfate	$\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$
Gypsum	Calcium sulfate	$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
Heavy spar	Barium sulfate	BaSO_4
Horn silver	Silver chloride	AgCl
Hypo	Sodium thiosulfate	$\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$
Indian red	Ferric oxide	Fe_2O_3
Kaolin	Aluminum silicate	$\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$
Lampblack	Impure carbon	C
Lanolin	Mixt. of cholesterol and esters
Laughing gas	Nitrous oxide	N_2O
Levulose	Fructose	$\text{C}_6\text{H}_{12}\text{O}_6$
Lime	Calcium oxide	CaO
Lysol	Cresol soap solution
Magnesia	Magnesium oxide	MgO
Magnesite	Magnesium carbonate	MgCO_3
Manganese black	Manganese dioxide	MnO_2
Marble	Calcium carbonate	CaCO_3
Marsh gas	Methane	CH_4
Milk of lime	Calcium hydroxide	$\text{Ca}(\text{OH})_2$

Common Name	Chemical Name	Formula
Milk sugar	Lactose	$C_{12}H_{22}O_{11} \quad H_2O$
Molybdenite	Molybdenum disulfide	MoS_2
Muriatic acid	Hydrochloric acid	HCl
Naptha (Petroleum)	A petroleum distillate	
Natron	Sodium carbonate	$Na_2CO_3 \quad 10H_2O$
Niter	Potassium nitrate	KNO_3
Nitro lime	Calcium cyanamide	$CaNCN$
Oil of vitriol	Concentrated sulfuric acid	H_2SO_4
Paris blue	Ferric ferrocyanide	$Fe [Fe (CN)_6]$
Paris green	Copper aceto-arsenite	$Cu [C_2H_3O_2]_2 \quad 3CuAsO_3$
Permanent white	Barium sulfate	$BaSO_4$
Petroleum ether	Benzine	
Phenic acid	Phenol	C_6H_5OH
Quicksilver	Mercury	Hg
Rock salt	Sodium chloride	$NaCl$
Saccharin	Benzoic sulfimide	$o-C_6H_4SO_2NHCO$
Salt	Sodium chloride	$NaCl$
Silica	Silicon dioxide	SiO_2
Slaked lime	Calcium hydroxide	$Ca(OH)_2$
Soda (washing)	Sodium carbonate	$Na_2CO_3 \quad 10H_2O$
Soda lime	Mixture of calcium oxide and sodium hydroxide	$CaO + NaOH$
Sodium hyposulfite	Sodium thiosulfate	$Na_2S_2O_3 \quad 5H_2O$
Soft soap	Potash soap	
Soluble glass	Sodium silicate	$Na_2SiO_3 + H_2O$
Spirit of hartshorn	Ammonia solution	NH_4OH
Spirit of salt	Hydrochloric acid	HCl
Spirit of wine	Ethyl alcohol	C_2H_5OH
Sugar of lead	Lead acetate	$Pb(C_2H_3O_2)_2 \quad 3H_2O$
Sugar of milk	Lactose	$C_{12}H_{22}O_{11} \quad H_2O$
Table salt	Sodium chloride	$NaCl$
Talc	Hydrated magnesium silicate	$Mg_3Si_4O_{10} \quad H_2O$
Tartar	Crude potassium bitartrate	$KHC_4H_4O_6$
Tartar emetic	Potassium antimonyl tartrate	$KSbC_4H_4O_6 \quad \frac{1}{2}H_2O$
T.N.T.	Trinitrotoluene	$C_6H_3(CH_3)(NO_2)_3 (1,2,4,6)$
Unslaked lime	Calcium oxide	CaO
Vanillin	Methyl ether of protocatechu aldehyde	$C_8H_8(OH)(OCH_3)CHO (1,2,4)$
Venetian red	Ferric oxide	Fe_2O_3
Verdigris	Basic copper acetate	$2Cu(C_2H_3O_2)_2 + CuO(?)$
Vitriol	Sulfuric acid	H_2SO_4
Washing soda	Sodium carbonate	$Na_2CO_3 \quad 10H_2O$
Water glass	Sodium silicates dissolved in water	
White lead	Basic lead carbonate	$2PbCO_3 + Pb(OH)_2$
Whiting	Calcium carbonate	$CaCO_3$

Courtesy of Chemical Rubber Company, Cleveland, Ohio

DAIRY PUBLICATIONS

Acta Anatomica	S. Karger. Arnold-Bocklinstrasse, 25. Basel, Switzerland
American Agriculturist	Ithaca, New York
American Milk Review	Urner-Barry Co., 92 Warren St., New York 7, N. Y.
Animal Breeding Abstracts	Commonwealth Agricultural Bureaux, Central Sales Branch, Farnham Royal, Bucks, England
Ayrshire Digest	Brandon, Vermont
Better Farming Methods	Mount Morris, Illinois
Biological Abstracts	University of Pennsylvania, 3815 Walnut St., Philadelphia, Pa.
Brown Swiss Bulletin	Beloit, Wisconsin
Canadian Journal of Animal Science	Agricultural Institute of Canada, 338 Somerset Street, West, Ottawa 4, Canada
Canadian Dairy and Ice Cream Journal	73 Adelaide St., West, Toronto, Ontario, Canada
Certified Milk	405 Lexington Ave., New York 17, N. Y.
Dairy Digest	The Borden Company, 350 Madison Ave., New York 17, N. Y.
Dairy Foods Review	393 Market Street, San Francisco, California
Dairy Industries	9 Gough Square, Fleet Street, London, E.C. 4, England
Dairy Record	St. Paul, Minnesota
Empire Journal of Experimental Agriculture	Oxford University Press, Amen House, Warwick Square, London, E.C. 4, England
Farm Journal	Washington Square, Philadelphia 5, Pa.
Farm Quarterly	22 East Twelfth Street, Cincinnati 10, Ohio
Farmer and Stock-Breeder	Dorset House, Stamford Street, London, S.E.1., England
Feed Stuffs	P. O. Box 67, Minneapolis 1, Minnesota
Fertility and Sterility	Paul B. Hoeber, Inc., Medical Book Department Harper Publishers, 49 E. 33rd St., New York 16, N. Y.
Food Engineering	McGraw-Hill, Inc., 330 West 42nd St., New York 36, N. Y.
Guernsey Breeder's Journal	Peterborough, New Hampshire
Hoard's Dairyman	Fort Atkinson, Wisconsin
Holstein-Friesian World	Lacona, New York
Ice Cream Field	19 W. 41th Street, New York 18, N. Y.
Ice Cream Review	1415 North Fifth St., Milwaukee 12, Wisconsin
Ice Cream Trade Journal	301 E. 45th Street, New York 17, N. Y.
Journal of Dairy Science	32 Ridgeway Circle, White Plains, N. Y.
Journal of Endocrinology	Cambridge University Press, 32 E. 57th St., New York 22, N. Y.
Journal of Heredity	American Genetic Association, 32 N. Elm Ave., Baltimore, Md.

Journal of Milk & Food Technology	Post Office Box 286 Shelbyville Indiana
Milk Dealer	1445 N. Fifth St. Milwaukee 12 Wisconsin
Milk Plant Monthly	912 Baltimore Kansas City 5 Missouri
Milk Products Journal	The Olsen Publishing Co. 1445 N. Fifth St., Milwaukee 12 Wis.
Nation's Agriculture	401 North Wesley Avenue Mount Morris Illinois
New England Homestead	Springfield Massachusetts
New Zealand Confectioner Ice Cream & Catering Journal	Box 2237 Auckland New Zealand
Rural New Yorker	353 West 30th Street New York 1 N. Y.
Southern Dairy Products Journal	88 Ellis Street N. E. Atlanta 3 Georgia
Successful Farming	Des Moines Iowa
Wallace's Farmer and Iowa Homestead	Des Moines Iowa
American Dairy Goat News	Richmond Virginia
Better Goat Keeping	Ipswich Massachusetts
Dairy Goat Bulletin	210 East 5th Street Charlotte N. C.
Dairy Goat Journal	Columbia Missouri
Sheep and Goat Raiser	Cactus Hotel Building San Angelo Texas
The Bleat	Box 2, Victoria British Columbia
The Goat World	Roanoke Virginia

DAIRY ORGANIZATIONS

American Association for the Advancement of Science
1515 Massachusetts Avenue N.W.
Washington D. C.

American Butter Institute
110 N. Franklin Street
Chicago Illinois

American Dairy Association
20 N. Wacker Drive Building
Chicago 6 Illinois

American Dairy Science Association
32 Ridgeway Circle
White Plains New York

American Farm Bureau Association
221 No. La Salle Street
Chicago 6, Illinois

American Feed Manufacturers Association, Inc.
53 West Jackson Boulevard
Chicago 4, Illinois

American Veterinary Medical Association
600 So. Michigan Avenue
Chicago 5, Illinois

Dairy Industries
Incorporating Ice Cream Manufacturer and Dairy Technology
9, Gough Square, Fleet St., London, E.C. 4, England

Dairy Industries Supply Association, Inc.
1108 Sixteenth Street, N.W.
Washington 6, D. C.

Evaporated Milk Association
203 N. Wabash Avenue
Chicago, Illinois

International Association of Ice Cream Manufacturers
1105 Barr Building
Washington 6, D. C.

International Association of Milk & Food Sanitarians, Inc.
P. O. Box 286
Shelbyville, Indiana

International Institute of Agriculture
Rome, Italy

Milk Industry Foundation
1145 Nineteenth Street, N.W.
Washington 6, D. C.

The National Association of Retail Ice Cream Manufacturers, Inc.
2223 Detroit Avenue
Toledo, 6, Ohio

National Cheese Institute
110 North Franklin Street
Chicago, Illinois

National Dairy Council
111 North Canal Street
Chicago 6, Illinois

National Dairymen's Association
Comstock, Wisconsin

National Ice Cream Mix Association, Inc.
234 Bowen Building
Washington 5, D. C.

National Milk Producers Federation
1731 Eye Street, N.W.
Washington 6, D. C.

New England Milk Dealers, Inc.
Boylston Street
Boston 16, Massachusetts

ABBREVIATIONS COMMONLY USED IN DAIRY
INDUSTRY LITERATURE

AAA	Agricultural Adjustment Administration
AAAS	American Association For the Advancement of Science
ADSA	American Dairy Science Association
AOAC	Association of Official Agricultural Chemists
amp	ampere
APHA	American Public Health Association
AR	Advanced Registry
ARO	Advanced Registry Official
AVMA	American Veterinary Medical Association
BAI	Bureau of Animal Industry
Bé	Baumé
BOD	Biochemical Oxygen Demand
bp	boiling point
BQC	Dibromoquinonechloromule
Btu	British thermal unit
cm	centimeter
C	centigrade also calorie
cgs	centimeter gram second
CIP	cleaned in place
c m c	Sodium Carboxymethyl cellulose (Ice Cream)
cp	chemically pure also centipoise
cu μ or cu mu or μ^3	cubic micron
cwt	hundredweight
DN	Digestible Nutrients
DRI	Dairy Research Institute (New Zealand)
DX	Direct Expansion Refrigerator System
FD	Every Day (Milk Delivery)
FOD	Every Other Day (Milk Delivery)
eg	for example
et al	and others
F	Fahrenheit
FCA	Farm Credit Association
FCM	Fat Corrected Milk
FFA	Future Farmers of America
FFMC	Federal Farm Mortgage Corporation
FSA	Farm Security Administration
FWFS	Fat in the Water Free Substance
gm gms	gram grams
gpm	gallons per minute
HIR	Herd Improvement Registry
hp	horsepower
ie	that is
IU	International Unit
kgm	kilogram
kva	kilo volt ampere
kW	kilowatt
lb	pound or pounds
LCI	Less than a Carload
ME	Mature Equivalent Basis
MIF	Milk Industry Foundation Washington D C
mgm	milligram
ml	milliliter
mm	millimeter
mu or μ	micron
m μ or $m\mu$	millimicron
N.A.A.B	National Association of Artificial Breeders
N fe	Nitrogen free extract
N F D M	Non Fat Dry Milk

N-P-K	Nitrogen-Phosphorus-Potassium
NRC	National Research Council
per	for each, or contained in each
ppm	parts per million
p.s.i. or psi.	pounds per square inch
R.	Réaumur
REA	Rural Electrification Administration
R. of M.	Registry of Merit
rpm. or R.P.M.	revolutions per minute
S.A.	Sanitarian Association
SCS	Soil Conservation Service
S.N.F.	Solids Not Fat
S.P.C.A.	Society Prevention Cruelty to Animals
sp. gr.	specific gravity
sp. ht.	specific heat
T.D.N.	Total Digestible Nutrients
temp.	temperature
TVA	Tennessee Valley Authority
USDA	United States Department of Agriculture
USP	United States Pharmacopoeia
USPHS	United States Public Health Service

MILESTONES OF MILK HISTORY*

- 1611 Cows arrive for Jamestown Colony.
- 1624 Cows reach Plymouth Colony.
- 1841 First regular shipment of milk by rail — Orange County to New York City.
- 1856 Pasteur experiments start.
- 1878 Continuous centrifugal cream separator invented by Dr. Gustav De Laval.
- 1884 Milk bottle invented by Dr. Hervey D. Thatcher, Potsdam, N. Y.
- 1886 Automatic bottle filler and capper patented.
- 1890 Tuberculin testing of dairy herds introduced. Test for fat content of milk and cream perfected by Dr. S. M. Babcock.
- 1892 Certified milk originated by Dr. Henry L. Coit in Essex County, N. J.
- 1893 Nathan Straus depots for pasteurized milk opened in New York City.
- 1893 Pasteurizing machines introduced.
- 1906 Paper single-service container patented.
- 1908 First compulsory pasteurization law (Chicago) applying to all milk except that from tuberculin tested cows.
- 1911 Automatic rotary bottle filler and capper perfected.
- 1914 Tank trucks used for transporting milk.
- 1924 Insulated milk tank cars introduced.
- 1927 Homogenized milk first sold successfully in Ottawa, Ont.
- 1932 Methods of increasing Vitamin D in milk made practicable. Commercial introduction of Homogenized milk in U. S.
- 1933 Fluid milk included in Army ration.
- 1942 Every-Other-Day milk delivery begun as war conservation measure.
- 1950 Farm Bulk Milk Tanks came into use.

* Courtesy of Milk Industry Foundation

BOOKS FOR DAIRY INDUSTRY

Title	Authors	Publisher
Homogenized Milk	Trout	Michigan State College Press East Lansing, Michigan
Market Milk	Kelly & Clement	John Wiley & Sons Inc., New York
Milk and Milk Products	Eckles Combs & Macy	McGraw Hill Book Co., New York
The Market Milk Industry	Roadhouse & Henderson	McGraw Hill Book Co., New York
Market Milk and Related Products	H. H. Sommer	The Olsen Publishing Co. Milwaukee, Wisconsin
Care and Handling of Milk	H. E. Ross	Orange Judd Publishing Co., Inc., New York
The Most Nearly Perfect Food	Crumbine & Tobey	Williams & Wilkins Co. Baltimore, Maryland
Milk and Milk Processing	B. L. Herrington	McGraw Hill Book Co., New York
Dairy Manufacturing Processes	E. L. Fouts & T. R. Freeman	John Wiley and Sons, Inc., New York
Elements of Dairying	T. M. Olson	The Macmillan Company New York
Principles of Dairying	Judkins & Mack	John Wiley & Sons Inc., New York
Fundamentals of Dairy Science	Associates of Rogers	Reinhold Publishing Corporation, New York
Dairy Science	W. E. Peterson	J. B. Lippincott Company, Philadelphia, Pennsylvania
Manual of Milk Products	W. A. Stocking	The Macmillan Company New York
Milk and Dairy Products	Lampert	Chemical Publishing Co., Brooklyn, N. Y.
Modern Methods of Testing Milk & Milk Products	Van Slyke	Orange Judd Publishing Co., New York
Testing Milk & Its Products	Farrington & Woll	Mendota Book Co., Madison, Wisconsin
Standard Methods for the Examination of Dairy Products	American Public Health Association	American Public Health Association New York
Techniques of Dairy Plant Testing	Goss	Iowa State College Press, Ames, Iowa
Practical Dairy Tests & Fundamentals of Dairying	A. O. Burke	The Olsen Publishing Co. Milwaukee, Wisconsin
Official & Tentative Methods of Analysis	Association of Official Chemists	Washington D. C.
Laboratory Manual for Elements of Dairying	Caulfield Baughman & Rosenberger	William C. Brown Company Dubuque, Iowa
The Testing & Chemistry of Dairy Products	J. A. Newlander	The Olsen Publishing Co., Milwaukee, Wisconsin
The Chemistry of Milk	W. L. Davies	O. Van Nostrand Co., Inc., New York
Testing Dairy Products & Dairy Plant Sanitation	G. H. Wilster	OSC Cooperative Association Corvallis, Oregon
The Milk Industry	Bartlett	The Ronald Press Co., New York
Condensed Milk & Milk Powder	Huntaker	O. F. Huntaker, La Grange, Illinois
The Dry Milk Industry	Cook & Oxy	American Dry Milk Institute Inc., Chicago, Illinois
Condensed Milk	A. Miyawaki	John Wiley and Sons Inc., New York
Dry Milk	C. H. Porter	The Olsen Publishing Co., Milwaukee, Wisconsin
Practical Manufacture of Cultured Milk and Kindred Products	A. O. Burke	The Olsen Publishing Co., Milwaukee, Wisconsin
By-Products from Milk	Whittier & Webb	Reinhold Publishing Co., New York
Milk and Food Sanitation Practice	H. S. Adams	The Commonwealth Fund, New York
Berry's Manual of Sterilization	Breed, Macey & Hochen	Williams & Wilkins Co., Baltimore, Md.
Dairy Bacteriology & Public Health	C. S. Bryan	Burgess Publishing Co. Minneapolis, Minnesota
Dairy Bacteriology	B. W. Hammer	John Wiley and Sons Inc., New York
Practical Dairy Bacteriology	F. Elber	McGraw Hill Book Co., New York
Quality Control of Market Milk	N. E. Lazarus	The Olsen Publishing Co. Milwaukee, Wisconsin
Disinfection & Sterilization	L. C. McCulloch	The Olsen Publishing Co., Milwaukee, Wisconsin
Surface Active Agents	Young & Coons	Chemical Publishing Co., Inc., Brooklyn, New York
Medical Uses of Soap	M. Fishbein	J. B. Lippincott Company Philadelphia, Pennsylvania
Food plant Sanitation	M. E. Parker	McGraw Hill Book Co., New York
Stream Sanitation	E. B. Phelps	John Wiley and Sons Inc., New York
The Microbiology of Foods	F. W. Tanner	Garrard Press, Urbana, Illinois
Dairy Microbiology	Foster Nelson Speck, Doetsch & Olson	Prentice Hall Publishing Co., Englewood Cliffs, New Jersey

<i>Title</i>	<i>Authors</i>	<i>Publisher</i>
Milk Ordinance and Code	U. S. Public Health Service	U. S. Public Health Service, Washington, D.C.
Dairy Engineering	J. T. Bowen	John Wiley and Sons, Inc., New York
Dairy Engineering	A. W. Farrall	John Wiley and Sons, Inc., New York
Food Analysis	Woodman	McGraw-Hill Book Co., New York
Analysis of Foods	Winton	John Wiley and Sons, Inc., New York
Technical Control of Dairy Products	Mojonnier & Troy	Mojonnier Bros, Chicago, Illinois
Laboratory Manual	Milk Industry Foundation	Milk Industry Foundation, 1145 Nineteenth St., N.W. Washington 6, D.C.
Manual for Milk Plant Operation	Milk Industry Foundation	Milk Industry Foundation, 1145 Nineteenth St., N.W. Washington 6, D.C.
Manual For Employees of Dairy Plants	Roadhouse & Hubbell	The Olsen Publishing Co. Milwaukee, Wisconsin
Flavor	E. C. Crocker	McGraw-Hill Book Co., New York
Odors, Physiology and Control	McCord & Witherridge	McGraw-Hill Book Co., New York
The Chemical Senses	R. W. Moncrieff	John Wiley & Sons, Inc., New York
Judging Dairy Products	Nelson & Trout	The Olsen Publishing Co. Milwaukee, Wisconsin
The Book of Butter	E. S. Guthrie	The Macmillan Company, New York
The Butter Industry	O. F. Hunziker	O. F. Hunziker, La Grange, Illinois
The Buttermaker's Manual	F. H. McDowall	New Zealand University Press, Wellington C. 1., N. Z.
Butter	Totman, McKay & Larsen	John Wiley & Sons, Inc., New York
Continuous Buttermaking	Wiechers & DeGoede	North-Holland Publishing Co., Amsterdam, Holland
Practical Buttermaking	G. H. Wilster	OSC Cooperative Association Corvallis, Oregon
Fluid Milk Marketing	Beal & Bakken	Mimir Publishers, Inc., Madison, Wisconsin
Casein and its Industrial Application	Sutermeister & Browne	Reinhold Publishing Company, New York
Milk Packaging for Retail Distribution	Clyde W. Park	A. H. Fugb, Cincinnati, Ohio
Cheese Making	J. L. Sammis	The Cheese Maker Book Co., Madison, Wisconsin
The Book of Cheese	Thom & Flisk	The Macmillan Company, New York
Cheese	Van Slyke & Price	Orange Judd Publishing Co., Inc., New York
Practical Cheddar Cheese Manufacture	G. H. Wilster	OSC Cooperative Association Corvallis, Oregon
Fancy Cheese in America	Flisk	American Shrop Breeder Co., Chicago, Illinois
Cheese Varieties & Descriptions	U.S.D.A. Agriculture Handbook #54	Washington, D. C.
Let's Sell Ice Cream	Hennerich	Ice Cream Merchandising Institute Washington, D. C.
A Manual for Ice Cream Makers	Dahle	Loyless Publishing Company Atlanta, Georgia
The Theory & Practice of Ice Cream Making	Sommer	H. H. Sommer, Madison, Wisconsin
The Ice Cream Industry	Turnbow, Tracy & Raffetto	John Wiley and Sons, Inc., New York
Practical Ice Cream Manufacture	Burke	The Olsen Publishing Co. Milwaukee, Wisconsin
The Manufacture of Ice Creams and Ices	Frandsen & Markham	Orange Judd Publishing Co., New York
Ice Creams and Other Frozen Desserts	Frandsen & Nelson	J. H. Frandsen, Amherst, Massachusetts
Ice Cream for Small Plants	Fsta H. Handy	Hotel Monthly Press, Chicago, Illinois
The Book of Ice Cream	W. W. Flisk	The Macmillan Company, New York
Management of Dairy Plants	Mortensen	The Macmillan Company, New York
The Knack of Managing	Trubhart & Watson	Factory & Industrial Management New York
Industrial Waste Treatment Practice	Eklridge	McGraw-Hill Book Co., New York
The Sale & Advertising of Dairy Products	Tompkins	The Olsen Publishing Co. Milwaukee, Wisconsin
Practical Selling	McClure	O. J. McClure, Chicago, Ill.
Breeding and Improvement of Farm Animals	Rice and Andrews	McGraw-Hill Book Co., New York
Breeding Better Livestock	Rice, Andrews & Warwick	McGraw-Hill Book Co., New York
Dairy Cattle Breeding	Gilmore	J. B. Lippincott, New York
A Veterinary Handbook for Cattlemen	Malley	Webb Publishing Co., St. Paul, Minnesota

DAIRY HANDBOOK AND DICTIONARY

<i>Title</i>	<i>Authors</i>	<i>Publisher</i>
The Mammary Gland	Furner	Lucas Brothers Columbia Missouri
Secretion of Milk	Espe & Smith	Iowa State College Press Ames Iowa
Successful Dairying	Knodt	McGraw Hill Book Co New York
Dairy Cattle	Yapp & Nevens	John Wiley and Sons Inc New York
Principles of Milk Production	Nevens	McGraw Hill Book Co New York
Dairy Cattle Feeding & Management	Henderson & Reaves	John Wiley and Sons Inc New York
Dairy Cattle and Milk Production	Eckles & Anthony	The Macmillan Company New York
Planning for Successful Dairying in New England	Wheeler & Black	Harvard University Press Cambridge Massachusetts
Modern Breeds of Livestock	Briggt	The Macmillan Company New York
Judging Dairy Cattle	Harrison Strohmeyer & Carpenter	John Wiley and Sons Inc New York
Applied Animal Nutrition	Crampton	Freeman & Co San Francisco California
Animal Sanitation & Disease Control	Dykstra	Interstate Danville Ill
Animal Nutrition	Ashton	Griffin & Company London England
Animal Nutrition	Maynard & Loomis	McGraw Hill Book Co New York
Veterinary Guide For Farmers	Stamm & Burch	Windsor Press New York
Animal Science	Ensminger	Interstate Danville Ill
Animal Breeding	Winters	John Wiley and Sons Inc New York
Feeds and Feeding	Morrison	Morrison Publishing Co Ithaca New York
Principles of Feeding Farm Animals	Bull & Carroll	Interstate Danville Ill
The Handbook of Feedstuffs	Rudolph Seiden	Springer Publishing Co Inc 44 East 23rd St New York N Y
Livestock Health	Rudolph Seiden	Springer Publishing Co Inc 44 East 23rd St New York N Y
Encyclopedia	Dukes	Comstock Publishing Co Ithaca New York
Physiology of Domestic Animals	Olson	The Macmillan Company New York
Elements of Dairying	Serviss and Ahlgren	John Wiley and Sons Inc New York
Crawland Farming	W R Thompson	State College Mississippi
The Pasture Book	Lush	Iowa State College Press Ames Iowa
Animal Breeding Plans	Snyder	Heath Boston Massachusetts
The Principles of Heredity	Kelley	John Wiley and Sons Inc New York
Principles and Methods of Animal Breeding	Larson Putney & Henderson	John Wiley and Sons Inc New York
Dairy Cattle Feeding & Management	Yapp	Clarendon Press Oxford England
Animal Physiology	Perry	Rutgers University Press New Brunswick New Jersey
Artificial Insemination of Farm Animals	USDA Yearbook 1956	L S Govt Printing Office Washington D C
Animal Diseases	Cowie	Com Agric Bureaux Great Britain
Pregnancy Diagnosis Tests	Marshall and Halman	University Press Cambridge Mass
Physiology of Farm Animals	Asdell	Comstock Publishing Co Ithaca New York
Mammalian Reproduction	Simon & Grossman	Saunders Philadelphia Pa
Anatomy of Domestic Animals	Baker	The Macmillan Company New York
The Home Veterinarian's Handbook	Sinnott Dunn & Dolbansky	Merk & Co Inc Rahway N J
The Merck Veterinary Manual	Prentice	McGraw Hill Book Co New York
Principles of Genetics		Houghton Mifflin New York
Breeding Profitable Dairy Cattle		

DICTIONARY
SECTION

SUGGESTIONS ABOUT THE USE OF THIS DAIRY DICTIONARY

Although the material in this *Dictionary* is arranged in alphabetical order, much of it appears also under headings and sub-headings such as *Butter*, *Cheese*, *Dairy Tests*, *Diseases in Animals*, *Feeds and Feeding Terms*, *Ice Cream*, *Milk and Cream*, each grouping virtually a dictionary within a dictionary. It was felt that bringing this material together in this manner would give certain users a continuous and more complete picture of the related subject matter contained in these groups of definitions than would be possible in a single alphabetical series.

Cross references in alphabetical order have been made to many of these entries, but they are also to be found alphabetically arranged under group subjects. For example we may cite *Acid Test*—See *Dairy Tests*. a user who thinks first of "acid test" will find the term under A, and one who thinks first of "dairy test" will find the term under D. The definition is given under *Dairy Tests*.

Each group heading is carried in the upper left hand corner of the left hand page or pages on which entries under that heading are listed, and in the upper right hand corner of the right hand page is indicated the last entry on that page.

The following index of the grouped definitions will be a further help or guide to readers who are seeking general information or who do not know certain technical terms.

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Abattoir—A slaughterhouse.

Aberdeen Angus—A breed of beef cattle. They are distinguished from other breeds by their black color, comparatively smooth coats of hair and polled character. A moderate amount of white on the underline, back of the navel, is permitted. Generally Aberdeen Angus are smaller than Short-horns or Herefords, but they are more compact and have shorter legs; because of this their weight is often underestimated. The native home of the Aberdeen Angus breed is in the counties of Aherdeen and nearby counties in northeastern Scotland. This breed was the last of the three major beef breeds to be brought to America.

Aberration—In genetics, any mutation from the wild type; e.g., aberrant individuals.

A chromosomal aberration is any gross change involving destruction, multiplication or gene rearrangement.

Abertam Cheese—See Cheese.

Abiogenesis—Spontaneous generation — the theory that life can occur without descent from parents.

Abnormal Flavor, (Off Flavor)—Any flavor deviating from the normal, pleasant taste and odor of milk and its products. See milk, cream, cheese, butter, ice cream, dried and evaporated milk defects.

Abnormal Milk—Roughly speaking, milk that differs from ordinary milk.

1. Colostrum milk—milk from cows at least up to 3 days after freshening.
2. Milk from cows in advanced stage of lactation.
3. Off-flavors due to feeding certain feeds, or feeds lacking important constituents.
4. Due to disease in the udder or parts of the body.

Abomasum—The fourth or true stomach of the cow. It has a capacity of about 20 quarts. The walls of this stomach secrete the gastric juices which contain less than one-half of one per cent hydrochloric acid, and the two enzymes, pepsin and rennin. Here true digestion begins. See also pepsin, rennin, ruminants, omasum, reticulum and rumen.

Abortifacient Infection. See Diseases in Cattle.

Abortion—See Diseases in Cattle.

Abortion Test—(See agglutination test and complement fixation test.)—A test of blood samples of cattle to determine the presence

or absence of infectious abortion. See Brucellosis, vibriosis, leptospirosis.

Abortive Teats—Same as After Teats, or Caudal Supernumeraries.

Abrade—To wear off by friction, as one hard metal rubbing against a soft metal. This is to be avoided in dairy machinery where smooth surfaces are essential to cleanliness.

Abrasives—Preparations such as carborundum, emery, pumice powder, sandstone, and whetstone used for cleaning or abrading by rubbing. Also, any substance used to roughen a surface, as sandpaper.

Absolute Pressure—The sum of gauge and atmospheric pressure after atmospheric pressure has been corrected for altitude.

Absolute Temperature—Observed temperature in degrees Fahrenheit plus 459.4°F (460°F in round numbers). Absolute Zero (-459.4°F or -273°C) is the temperature at which all molecular motion theoretically ceases, i.e. where a theoretically perfect gas would have no volume or pressure. Absolute temperature is sometimes expressed in degrees Kelvin (°K.)

Absolute Thermal Death Point—See Thermal Death Point.

Absolute Units of Force—The dyne, the force which will produce an acceleration of one centimeter per second each second in a gram mass. The gram weight or weight of a gram mass is the cgs gravitational unit. The poundal unit is that force which will give an acceleration of one foot per second to a pound mass.

Absorption—A term in physiology denoting the act of imbibing of fluids by living cells or tissues, especially the passage of digested food through the tissues of the alimentary tract into the blood and lymph from which it is transferred to the various tissues of the body. The taking up of a substance by cohesive, chemical or molecular action. The incorporation or assimilation of one substance in another as of a gas in a liquid.

In optical work, absorption signifies the diminution of intensity of light of specific wave length on passage through a medium. This may produce a change in the medium through which the light passes: Ex.—It is known that the absorption of light from sunlight destroys vitamin C in milk and unfavorably affects the flavor.

Absorption Number—See Iodine Number.

ABSORPTION SYSTEM

Absorption System—A mechanical system of refrigeration based upon the fact that water absorbs various vapors having a low boiling point and that these vapors are in turn separated from water by heating.

Aqua ammonia is pumped to the generator where it is heated and the anhydrous ammonia distilled off as a gas. This gas is then condensed to a liquid state in the condenser from whence it passes to the receiver from the receiver the ammonia goes through an expansion valve into the brine cooler where it expands into a gas and takes up the heat of the brine. From here the gas enters the absorber where it is reabsorbed and the cycle is completed.

The absorption system is used by only a few of the larger dairy plants in this country. See Refrigeration Systems.

Acceleration—The time rate of change of velocity.

Accelerators—See Co-enzymes.

Acclimation—Sometimes used to identify that period of time in the processing of semen for freezing after collection until glycerolation includes cooling from body temperature to 5°C.

Accredited Areas—A township, county, state or states where bovine tuberculosis (TB) has been reduced to less than 0.5% of its cattle according to U.S.D.A. official test. Herds in this area are accredited herds. Cattle from this circumscribed area may be shipped interstate without further TB test. See Certified Areas.

Accredited Herd—A herd of cattle that has been tested for tuberculosis and/or brucellosis and found free of the disease on two successive annual tests or three semi-annual tests. The tests must be conducted according to approved methods and under the supervision of the Bureau of Animal Industry of the United States Department of Agriculture or of a regularly employed veterinary inspector of the State in which co-operative tuberculosis or brucellosis eradication is being conducted.

Accredited Herd Plan—A plan whereby herds of dairy cattle can be accredited as free from tuberculosis and brucellosis by the State Department of Agriculture in cooperation with the U. S. Department of Agriculture. The herd must be retested at specified intervals and the rules for accreditation must be carefully followed.

Accredited Milk—Milk from a herd accredited for both tuberculosis and brucellosis.

Accumulator Tank—A tank sometimes installed at the bottom of the cooler to receive milk in case an accident at the bottling machine should delay the filling of the bottles. The milk will flow by gravity into the bowl of the bottle filler when the tank is placed above the bottling machine.

Acetic Acid— CH_3COOH . A colorless pungent organic acid sometimes resulting from bacterial fermentation in dairy products. The odor of acetic acid may be so pronounced as to be objectionable especially in old cream but it may also be desirable as in the ripening of butter cultures and cheese. Commonly known as the acid in vinegar.

Acetoin—See Acetyl methyl-carbinol.

Acetonemia—See Diseases in Cattle.

Acetylation—The introduction of one or more acetyl groups into a compound.

Acetyl Methyl Carbinol—A compound formed in butter cultures by the action of citrate fermenting microorganisms.

A decomposition product of lactose resulting from starter production and such organisms as *S. lactis*, *S. citrovorus*, *S. parvitolvorus* and *S. cremoris*.

Acetyl Value—The number of milligrams KOH required for the saponification of the acetyl assimilated by one gram of fat on acetylation. This value is a measure of the free hydroxyl (OH) groups in a fat.

Acid—A substance which in solution gives off protons (H⁺). Acids are classified as strong or weak on the basis of their degree of dissociation to form hydrogen ions. Hydrochloric and sulfuric acids are examples of strong acids being nearly completely dissociated in solution. Acetic acid is an example of a weak acid.

Acid Casein—Free Casein. See Cheese.

Acid Cleaners—Cleaners which depend on acid or nearly neutral properties rather than alkaline properties for their cleaning ability. Usually primarily weak acids or strong acids treated to slow down activity. Useful in removing milk stone deposits and in cleaning high temperature equipment.

Acid Cur—See Cheese Defects (Color Cheddar).

Acid-fast Bacteria—Bacteria which are not readily decolorized by acids or other agents when stained with the common aniline dyes.

Acid, Fatty—See Fatty Acids.

Acid Flavor—See Ice Cream Defects.

Acid Glaes Cheese—Short Bodied Swiss. See Cheese Defects (Swiss).

Acid Hydrometer—A special hydrometer that may be used for testing the specific gravity of heavy liquids (sp.gr. 1.80-1.85). It is used in the dairy industry especially in testing sulfuric acid. It is allowed to float in the acid, and the specific gravity is read from the scale where it coincides with the upper surface of the liquid. It is graduated to give correct readings at 60°F.

Acidification—See Cheese.

Acidifier—A substance whose presence causes the formation of acid, or a substance which causes souring.

Acidifying Agents—See Cheese.

Acidimeter—Same as Acid Hydrometer.

Acidimetry—The determination of the amount of acid contained in a solution by titration with a standard alkali solution.

Acidity—The quality of being acid or sour. The unit of acid or degree of sourness of a substance. Normal milk has an acidity of less than 0.2% expressed as lactic acid. Acidity in milk is commonly determined by titration with tenth normal sodium hydroxide or, more accurately, by determining the hydrogen ion concentration or pH. See Mann's Acid Test and pH.

Acidity Measurements of Cheese and Curd—See Cheese.

Acidity, Titratable, Determination of, in Cream Cheese—See Dairy Tests.

Acid Measure—A small glass cylinder of 17.5 cc. capacity used in the Babcock test for butterfat.

Acidophilie—As applied to bacteriology, a term describing acid-loving microorganisms, i.e. microorganisms which will grow best in an acid medium, as, for example, yeasts and molds—See Aciduric.

Aridophilus Cheese—See Cheese.

Aridophilus Milk—See Milk, Fermented.

Acidoproteolytic Coccus—Same as Streptococcus liquefaciens.

Acidosis—A condition of the blood which is brought about by an increase in acidity as a result of metabolic processes. There is a consequent reduction in the amount of alkali in the blood available for the protection of the reaction.

Acid Soil—See Soil, Acid.

Acid Test—See Dairy Tests.

Acidulate—To make moderately sour or acid.

Aciduric—Acid-tolerant; capable of growing in acid media, but preferring media that are somewhat alkaline.

Acid Value—The amount of free fatty acids in a fat which are not combined with glycerol. It is determined by titration and expressed as mgms. of KOH per gram of fat.

Acidy—A term used to designate a certain off-flavor which is rather common and very objectionable in dairy products. It is quite easily detected, for the acid or sour flavor is usually noted before any others.—See Butter, Milk, Ice Cream and Cheese Score Cards.

Acquired Character—A change in structure or function brought about by the individual's response to its environment. There is no evidence that such characters can be inherited, since such changes effect only the soma, not the germ plasma.

Acre—Equal to 4,840 square yards or 43,560 square feet or 160 square rods. See Area Measure in Weights & Measures table in the Reference section.

Acre Furrow Slice—The dry weight of the top six inches of an acre of a given soil, usually considered in fertilizer calculations as approximately 2,000,000 lb.

Actinomyces—A genus of organisms of the family Actinomycetaceae, whose members are filamentous and often branched. This group is very abundant in dairy products and is responsible for many of the bad flavors and deterioration of dairy products.

Actinomycosis (Lumpy Jaw)—See Diseases in Cattle.

Activity Test—See Dairy Tests.

Acuminate—Having a prolonged and gradually tapering point. Ex. Blades of grass.

Adhesion—The state of being attached or sticking together. A molecular force, the result of which causes particles to stick together.

Adipose Tissue—Fatty tissue of animals

Administered Price—A fixed price for a certain commodity like milk agreed to by a board or by a government agency or by a number of individual buyers and sellers of that commodity or by a company or groups of companies holding a controlling share of the commodity whose price they determine

Compare — **Free Price**

Adrenalin—A trade name for epinephrine a hormone produced by the adrenal glands which cause the blood vessels to contract thus slowing down the action of oxytocin

Adrenals—Adrenal glands are paired ductless glands commonly called suprarenal glands located near the kidneys. The outer portion or cortex produces hormones which regulate salt and water balance and carbohydrate metabolism. The inner portion or medulla secretes the hormone adrenalin involved in many functions

Adsorption—The phenomenon in which a surface active substance concentrates at a surface

Adult—An animal, plant or person that has reached maturity

Adulterate—To make impure as adding water to milk or impurities to feed

Adulterated Butter—See **Butter**

Adulterated Milk—Milk the composition of which has been altered by the subtraction of some ingredients or by the addition of various substances usually with fraudulent intent or as a means of escaping legislative regulations of standard milk quality. The most common forms of adulteration detected are

- 1 Addition of water
- 2 Skimming of milk (skim milk)
- 3 Addition of both water and skim milk
- 4 Addition of coloring matter to restore color lost by skimming or watering
- 5 Addition of preservative in order to keep milk salable for longer period of time
- 6 Addition of thickening agent in order to restore body and viscosity
- 7 Reconstituted milk

Advanced Registry—A system of registration for purebred registered cows that have produced under official supervision of the breed association and the State Experiment Station a specified amount of butterfat or of both milk and butterfat in a given period of time. Advanced Registry records are both

short time (7 and 30 days) and long time (10 months and 1 year)

Features

- 1 It is sponsored by the National Dairy Breed Registry Associations
- 2 A breeder may enter one or more selected registered cows at any time
- 3 A preliminary dry milking is required in addition to the 24 hour test
- 4 Daily milk weights are required
- 5 Breed Associations publish results and publicize high records
- 6 The State Supervisor of Official Testing — Extension Dairyman — is responsible for the supervision of the tests

Also known as **Advanced Registry Official** or **ARO**

Advanced Registry Testing—There are two terms generally applied to Advanced Registry Tests though they do not have the same meaning for all the cattle associations. For all the breed associations except the Holstein Association the term official is used when a test has been checked by an official appointed with the Holstein Association however only the records made while the supervisor is present are called official. When the tests are made at intervals they are known as semi-official. Tests are classified for the time for which they continue. There have been 7-day, 30-day, 305-day and annual tests. The 305-day test with a calf within fourteen months is the most popular at the present time.

Detailed information regarding these tests can be secured from the various dairy breed associations or from the dairy extension departments of our various agricultural colleges.

Adventitious—Arising at an unusual place on the plant, said of buds and roots

Aeration—Exposure of milk to the atmosphere while heating to pasteurization temperature (not during holding period) to minimize feed flavor if present. Milk is commonly aerated over surface coolers after milking to help remove undesirable gases and odors.

Introduction of air into a substance such as soil or a liquid

Also the process of forcing air or gas usually carbon dioxide under pressure into a liquid

Aerator—The apparatus which supplies with air or gas a fumigator used to bleach grain destroying fungi and insects

Aerobacter Aerogenes—The type species of organisms of the genus *Aerobacter*. These organisms consist of motile or non-motile, gram negative, non-spore-forming rods, fermenting glucose and lactose with acid and gas production. They are able to produce acetyl methyl carbinol, utilize uric acid as a source of nitrogen, and are generally non-pathogenic. The aerobacter group includes primarily organisms coming from soil or grains, as distinguished from *Escherichia*, of primarily fecal origin.

Aerobic—A descriptive term applied to microorganisms which grow best in the presence of free oxygen in contrast to anaerobic organisms which grow only or best in the absence of free oxygen.

Aerobic Oxidase—Same as Peroxidase.

Afterbirth—The placenta and membranes with which the fetus is connected, and which are expelled after delivery. In cows usually the afterbirth is expelled within a few hours after the calf.

Cows far along in years or in poor condition because of disease may retain the afterbirth, with the result that special attention is necessary.

Afterbirth, Retention of—See Diseases In Cattle.

Aftermath—See Rowen.

After Teats—Extra or superfluous teats with small glands but these glands usually do not develop. Also called Caudal Supernumeraries or Abortive Teats.

Agalactia—See Diseases in Cattle.

Agar-agar—An edible, non-nitrogenous material, largely carbohydrate, obtained from certain sea-weeds (red algae), especially Ceylon moss and the Oriental species of *Gelidium*, native to the Asiatic coast of the Pacific Ocean. It is used as a solidifying agent in culture media for bacterial growth because its solutions remain solid at higher temperatures than those of gelatin; and as a laxative; and in the Orient, it is used in soups and jellies. In combination with certain gums or gelatin it is used to some extent as a stabilizer in ices and sherbets.

Agar Disc Method—A bacteriological method for determining the contamination of metal or wooden surfaces, such as butter churns, pasteurizers, and the like. It consists of allowing a small amount of a special agar medium to solidify in contact with the surface to be studied, the transferring of the

formed disc to a sterile petri dish, and finally the counting of the colonies of bacteria that develop on incubation.

Agar Plate Counts on Dairy Products—See Milk Industry Foundation Laboratory Manual.

Age—The period of individual existence.

Age Conversion Factors—Factors used to standardize production records to a uniform age. Usually the record is converted to a mature basis and maturity is usually considered to be five years although this may vary. See Mature Equivalent Basis.

Aged—An animal that is past the age of maturity; advanced in years, old.

Also, products fully ripened to develop flavor, as aged cheese.

Aged Cheese—See Cheese.

Agglutination—The clumping or clustering as of fat globules in milk by specific substances called agglutinins.

Agglutination Test—During the course of many diseases, the body produces specific protective substances called antibodies. One of the types of antibodies is called agglutinin. If specific bacteria are added to the blood of animals containing agglutinins, they will "clump" or agglutinate. The relative number of these agglutinins is determined by diluting the blood serum in a series of tubes.

In the diagnosis of *brucellosis*, an agglutination in a dilution of 1:100 or higher is considered positive. The agglutination test is also used for *vibriosis* and *leptospirosis*.

Agglutinins—Antibodies found in an immune serum which when added to a suspension of its homologous microorganisms causes the organisms to adhere to one another, forming clumps.

Aggregate—A clump, cluster or mass of soil particles.

Aggregation of Soil Particles—The clumping or grouping of soil particles into larger units or aggregates through the influence of clay or organic matter.

Aging—The holding of a product at a relatively low temperature in order to bring about desirable changes of a physico-chemical nature. These changes are not bacterial as in ripening. Ice cream mix and whipping cream are products commonly aged.

Aging the Ice Cream Mix—See Ice Cream

Agitation—Bulk milk is agitated to prevent fat from rising to the top and also to a certain extent to aerate to remove odors.

Excessive agitation breaks up bacterial clusters and thus encourages increased growth of bacteria.

Agitator—An implement or apparatus for shaking or mixing, as paddles in a holding vat, pasteurizer churn or sprayer.

Agitator Feed—A device consisting of adjustable blades and rotating wheels used to prevent clogging in implements for broad casting seed or fertilizer.

Agitator, Mechanical—A mixer run by electric motor to stir milk thoroughly in order to take a more accurate fat test. Mechanical agitators have either two or three blades.

Agitator, Two-bladed—An agitator with two blades, each 3 inches wide and 7 inches long tipped at an angle of 40-45 degrees and run at 40-60 revolutions per minute. This type of agitator will thoroughly mix milk in an ordinary weigh tank.

Agitator, Three Bladed—This type of agitator mixes milk satisfactorily and is the same size as the two bladed type except that it is tipped at a 30-40 degree angle.

Agitators—See Cheese.

Agrarian—Relating to land.

One who favors a more equitable division of land.

Agribusiness—A term being applied to agricultural production plus all work and business connected with the processing, marketing and distribution of all food feed and fiber products.

Agriculture—The scientific cultivation of the ground for the production of food for man and animal.

A term sometimes used in a broader sense to include livestock raising, farming, etc.

Agronomist—A specialist in the study of the principles of growing field crops.

Agronomy—The branch of agriculture which deals with the theory and practice of field crop production, soils and soil management.

Air-borne Bacteria—Any bacteria capable of surviving and being transported by air currents.

Airborne Phage—Bacteriophage which is air borne and may contaminate the milk or cheese and stop the action of the lactic organisms. See Bacteriophage.

Air Brake—A brake operated by a piston which is driven either by compressed air or by the suction of a partial vacuum.

Air Condenser—A condenser which uses air as the cooling medium.

Air Conditioning—A term applied mainly to processes which regularly involve temperatures above cold storage and which introduce outside air into the system. It involves control of purity, velocity, humidity and temperature of atmosphere.

Airliquid Line—The line formed by the surface of a liquid with the immediate air layer.

Air Survey—A survey using photographs taken from an aircraft.

"Air Tight" Milk Clarifier—A machine which removes sediment (leucocytes—some milk whey) from the milk by centrifugal force. The milk leaves the machine through one spout and the sediment is thrown to the inner surface of the bowl in the form of a sticky layer.

Airtight Separator, Creamy—See Milk Separators.

ALA Silage—See Feeds & Feeding.

Alanine— $\text{CH}_3\text{CH}(\text{NH}_2)\text{COOH}$. An amino acid found in milk proteins. It is found in casein to the extent of about 3 gms per 100 gms and in B-lactoglobulin in the amount of about 7 gms per 100 gms.

Albino—An animal or plant showing a lack of pigment on all or part of its surface. Examples by selective breeding races of albinos have been produced as the white mice.

Albumin—A class of proteins, soluble in pure water found in blood, milk, muscle, white of egg and other animal and vegetable substances.

The albumin of milk is called lactalbumin and forms about 0.5% of cow's milk. It is similar to albumin of blood but not identical with it.

Alcohol—A colorless volatile, inflammable liquid $\text{C}_2\text{H}_5\text{OH}$.

Alcohol Coagulation—The coagulation of some of the proteins of milk by the addition of alcohol. See Alcohol test.

Alcohol Test—See Dairy Tests.

Aldehyde Reductase Test—See Dairy Tests.

Aldolase—An enzyme, present in milk, which catalyzes the reversible splitting of fructose 1,6-diphosphate into dihydroxyacetone phosphate and phosphoglyceric aldehyde.

Alemtejo Cheese—See Cheese.

Alfalfa—See Feeds & Feeding.

Alfalfa Caterpillar—The larva of a small yellow butterfly that feeds on alfalfa and clover.

Alfalfa Hopper—A leafhopper which sucks juices from alfalfa. Same as the potato leafhopper.

Alfalfa Leaf Meal; Alfalfa Meal; Alfalfa-Molasses Feed; Alfalfa Seed Screenings; Alfalfa Silage; Alfalfa Stem Meal—See Feeds & Feeding.

Alfalfa Weevil—A European snout beetle which when in the larva state eats the alfalfa leaves.

Alfal-Laval (Lindstrom) Test—See Dairy Tests.

Alga—Any plant of the group algae, as seaweed and pond scums. A seaweed (broadly, a marine or fresh-water form) as kelp, dulse, sea lettuce, etc; chiefly used in the plural, algae.

In dairying used as a stabilizer in ice cream and dairy spreads. See Stabilizers.

Alginate—See Sodium Alginate, Stabilizers.

Alimentary Canal—The tubulous passageway leading from the mouth to the anus. It includes the mouth, pharynx, esophagus, stomach, small intestines, large intestines and rectum. Its function is the digestion and absorption of the nourishment for the whole body.

The alimentary canal of the ruminants, which include the dairy animals, is much more complex than that of other animals. It includes the mouth, the gullet, the four compartments of the stomach, the small intestine and the large intestine. These together form a long, winding canal approximately 180 feet long in the average dairy animal. The dairy animal has four compartments of the stomach:

1. The rumen, or paunch.
2. The reticulum, or honeycomb.
3. The omasum, or manyplies.
4. The abomasum, or true stomach.

The first three of these may be considered as an enlargement of the gullet and should not be considered a true stomach although they are of great importance in the digestion of coarse feeds.

Aliquot Sample—The amount of milk or cream constituting each sample going into a composite sample of milk. A sample of milk taken in proportion to the amount of milk to be sampled.

Alizarin Alcohol Test—See Dairy Tests.

Alkali—See Base.

Alkali Disease—See Diseases in Cattle.

Alkali-forming Bacteria—Saprophytic bacteria in milk that produce an alkaline reaction in milk.

Alkaline—Pertaining to a substance basic in reaction and capable of neutralizing acids. Opposite of acid; of soil, sweet (pH above 7.0).

Alkaline Soil—See Soil, Alkaline.

All-American Cattle Selections—The selection of the most outstanding animals in the various show divisions on the basis of type by the Holstein Breeders' Association. This selection is made by prominent judges officiating at the large national and international dairy shows who cooperate with the editor of the *Holstein-Friesian World*, official organ of the association. It is a distinct recognition to have an animal selected for this honor.

Allantois—An outgrowth of the hind-gut of the embryo forming in the cow a large fluid-filled sac externally between the amnion or inner fetal sac and the serosa or outer fetal sac. Fusion of the serosa and allantois forms the chorion or fetal placenta. The urinary bladder of the fetus develops internally from a remnant of the allantois. See Placenta, Chorion and Amnion.

Alleghany Metal—A trade name for stainless steel. See Stainless Steel.

Allele, Allelomorph—One of a series of two or more genes or factors occupying a particular locus in homologous chromosomes. The diploid individual thus possesses two alleles at a particular locus which may be alike (homologous) or unlike (heterologous).

Allele—One of a series of two or more alternative forms of a gene occupying a specific point on a chromosome. Alleles influence the same character, as hair color in

Holstein cattle but in different ways, as black or red hair. Since chromosomes exist in pairs within the individual each individual generally possesses two alleles of each sort of gene which may be alike (homologous) or unlike (heterologous). Thus a cow might carry two black genes or one black and one red gene (in both cases of which hair color would be black because the black gene is dominant over the red gene) or two red genes (in which case hair color would be red).

Allgäuer Rundkase or Allgäuer Emmentaler—See Cheese

Alloy—A combination of two or more metals which when melted together have the property of combining with each other to form either mixtures or definite compounds.

Alluvial—Deposits of soil formed by the action of water.

Alluvium—A deposit of earth, sand or other material made by the ordinary mechanical action of running water, soil or land so formed.

Alpha Lactose, (National)—Industrial type milk sugar. Less soluble than Beta Lactose.

Alpha tocopherol—See Vitamin E.

Aipin Cheese—See Cheese.

Alske Clover—See Feeds & Feeding.

Altenburger Cheese—See Cheese.

Alternating Current Electricity—A current of electricity that changes or reverses its direction of flow at regular intervals. Starting at zero the current increases to a maximum then decreases to zero, reverses its direction and increases from zero to a maximum and falls to zero in the opposite direction.

Alum—The sulphate of potassium and aluminum sometimes used as a styptic and as astringent.

Aluminate—Al(Off), as a constituent in washing powder is sometimes added for protection of aluminum parts.

Aluminum—Al. A white metal of very light weight which is becoming increasingly popular in the dairy industry in the United States and is in extensive use in Europe. Besides its light weight, aluminum has another advantage in that it has no harmful effect on milk. Its limited use in dairies to date in this country can be attributed to the fact that it readily yields to pitting and corrosion especially when in contact with alkali.

lue washing solutions. This pitting and corrosion may be overcome, however, by the addition of sodium silicate to the washing solution or by the use of non-corroding washing compounds.

Aluminum Foil—An aluminum wrapping for cheese which may be heat sealed. It is also used for butter wrappers and caps for milk containers and for packaging various food products.

Alveolus—A very small structure almost spherical in shape lined with a single layer of epithelial cells in which the milk in the udder is manufactured. Also called Acinus.

Ambert Cheese—See Cheese.

Amoeba, (Amoeba)—One of the simplest animals widely distributed in stagnant fresh water.

A minute one-celled protozoan animal or organism capable of changing shape because of a non rigid cell wall.

American Association Test For Fat in Skim Milk and Buttermilk—See Dairy Tests.

American Cheese (Cheddar), Commercial Styles of—See Cheese.

American Crossbred Dairy Cattle Club—See Handbook.

American Dairy Cattle Club—See Handbook.

American Guernsey Cattle Club—An association of the breeders of purebred Guernsey cattle with headquarters at Peterborough N.H. See Breed Associations. See Handbook.

American Jersey Cattle Club—An association of the breeders of purebred Jersey Cattle with headquarters at Columbus Ohio. See Breed Associations. See Handbook.

American Knives—See Cheese.

American Mow Drying System—See Mow Drying System (American).

American or American Type—See Cheese.

American Process Cocoa—Cocoa prepared in the usual manner without treatment with alkalis. Sometime called acid cocoa. Used to a considerable extent in the manufacture of chocolate-flavored dairy products but not so desirable under most conditions as Dutch Process Cocoa.

American Swiss—See Cheese.

Amicron—One of the smallest particles detectable with the ultra microscope, about 1×10^{-7} cm. in diameter.

Amino Acid—Any one of a class of organic compounds containing the amino group and the carboxyl group which form the chief structure of proteins. Eight amino acids, derived from food sources, which are needed for the maintenance of nitrogen equilibrium in adult man are termed "essential" and are: isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophane and valine. Some of the other naturally occurring amino acids are: alanine, arginine, aspartic acid, cysteine, cystine, histidine, glutamic acid, glycine, proline, serine, thyroxine and tyrosine.

Essential Amino Acid	Amount present in Casein of Milk* Per cent
Isoleucine	6.5%
Leucine	12.4
Lysine	6.9
Methionine	3.5
Phenylalanine	5.2
Threonine	3.9
Tryptophane	1.8
Valine	7.0

*Corrected on basis of ideal protein containing 16% of nitrogen. (From *Nutritional Data* H. J. Heinz Co. 1950).

Ammeter—An instrument used to determine the rate of flow of electricity in a circuit.

Ammonia— NH_3 . A colorless gas basic in water solution possessing a pungent odor and taste. Because of its great latent heat of vaporization and its property of readily liquefying under pressure, ammonia is extensively used in dairy refrigeration. Fresh milk contains 3-4 parts ammonia per million, the quantity increasing with the age of the milk. Good soured milk should not contain over 10 parts NH_3 per million.

Ammonia Condenser—See Condenser.

Ammonia Fixation—Adsorption of ammonium ions by soils or minerals in such form that they are neither water soluble nor readily exchangeable.

Ammonification—The formation of ammonium compounds, as in soils by soil organisms, or in the decomposition of soil organic matter.

Production of ammonia as a result of the biological decomposition of plant or animal material containing nitrogen.

Ammonium Nitrate—A nitrogen fertilizer containing approximately 35% nitrogen.

half of which is in the nitrate form and half of which is in the ammonium form.

Ammonium Sulfate—A nitrogen fertilizer containing sulfur and nitrogen in the ammonium form. Per cent of nitrogen is approximately 20 to 21.

Ammo Phos—A synthetic phosphate of ammonia fertilizer containing approximately 11% nitrogen and 48% phosphoric acid.

Amnion—The inner membrane of the sac which surrounds the fetus in the uterus and contains the water or amniotic fluid.

Amorphous—Having no well-developed organization, shape or form. It refers to the lower form of animal and vegetable life.

Ampere—A measure of electric current flow. The current flow produced by a potential of one volt acting against a resistance of one ohm.

Amphiprotic—Capable of both yielding and accepting protons (H^+).

Amphoteric—Partaking of the nature of both an acid and a base. See Amphiprotic.

Ampullae—Accessory genital organs of the male animal.

Amyl Alcohol— $\text{C}_4\text{H}_9\text{OH}$. Normal amyl alcohol (the straight chain isomer) is used in a great many tests for milk and its products. This alcohol is colorless, boils at 138°C . and has a specific gravity of 0.829.

Amylase—An enzyme capable of catalyzing the hydrolysis of starch. Milk contains at least one amylase.

Amylopsin—Also known as pancreatic diastase. An enzyme contained in pancreatin capable of converting starch into dextrin and maltose. It acts best in neutral or slightly alkaline media at a temperature of between $86-101^\circ \text{F}$. ($30-40^\circ \text{C}$.), and is destroyed at 149°F . (65°C).

Anaerobes—A term applied to microorganisms which grow in the absence of free oxygen, as anaerobic bacteria.

Anaerobic—Living or active in the absence of molecular oxygen. An obligately anaerobic organism thrives only in the absence of air or free oxygen while a facultatively anaerobic organism is capable of living either in its absence or its presence.

Pertaining to, or induced by anaerobic organisms, as anaerobic decomposition.

Anaerobic Oxidase—See Reductase or Dehydrogenase.

Anal Canal—The end section of the rectum, directed backward and downward. The anal part of the rectum, i.e. the part from the top of the coccyx to the anus.

Analysis—The resolution of compounds into their constituent parts or elements. The term is also employed in respect to the processes by means of which chemists ascertain the constituents of substances or in bacterial analysis which involves a determination of the kind and number of bacteria in liquid systems such as milk.

Analysis, Chemical of Soils—The determination of the various chemical constituents present in a soil and the amounts in which they are present.

Analysis, Mechanical of a Soil—The mechanical separation of a soil into various size groups (sand, silt and clay separates) and the percentage of each present.

Anatomy—A science that treats of the structure of animals or plants.

Ancestor—That from which an animal or plant has descended, a forebearer.

Ancestry—A series of ancestors who have formed the line of lineage in natural descent.

Anchor Bolt—A bolt used to hold an object to a structure or a piece of masonry.

Anchor Log—A piece of concrete, wood or metal buried in the ground to hold a guy line firmly.

Anchor Plate—A piece of metal or wood attached to or embedded in and fastened for holding or supporting as a cable.

Anchor Rod—An anchor bolt.

Ancien Imperial Cheese—See Cheese.

Anemia—A condition of the blood in which the red corpuscles are reduced in number or are deficient in hemoglobin. Certain foods and feed lacking in iron and copper can lead to nutritional anemia in children and livestock.

Anesthesia—Local or complete loss or absence of feeling or sensation which can be brought about by the injection of drugs as cocaine or by inhaling ether or chloroform etc.

Anesthetic—A drug or agent which produces local, or general anesthesia for relief of pain or dulling sensations especially during operations and illness.

Anestrous, (Anoestrous)—Without sexual heat as the anestrous period in female mammals.

Anestrus, also Anestrus—The period between sexual heat of animals.

Angora Goat—A domestic goat grown principally for its long silky hair, called mohair. It differs from the wool of the sheep in not felting. The fleece is pure white in color, grows as long as 10 inches in a year and hangs in ringlets or wavy curls. The goat is a natural browser and not a grazer and is therefore also valued as a rennovator of brush land.

Angstrom Unit—One tenth of a millimicron or one ten-millionth of a millimeter. It is used in the measurement of light wave lengths.

Anhydrate—To dehydrate to remove moisture.

Anhydrous Ammonia—Ammonia free from water and existing in both the gaseous and liquid form. Anhydrous ammonia is used in the compression system of refrigeration.

Liquid ammonia used as a nitrogen fertilizer. It contains approximately 82% nitrogen.

Anhydrous Butterfat—See Butter.

Anhydrous Milk Fat—Dry fat which according to the standards of the U.S. Quarter master Corps must contain not less than 99.8% butterfat and not more than 0.1% moisture or curd. This fat is made only from high quality fresh milk or fresh sweet cream and is not to be confused with butter oil which may be made from butter or sour cream and does not meet the rigid specifications of anhydrous milk fat.

Aniline Dye—A yellow coal tar product used quite often some years ago to color milk so it would look richer in butterfat. Its use is not permitted now.

Animal—Any member of a group of living beings typically endowed with sensation and voluntary motion as distinguished from a plant.

Animalcule—A small minute animal quite invisible to the naked eye.

Animal Diseases Laboratory—See Plum Island Animal Disease Laboratory.

Animal Husbandry—That phase of agriculture which deals with the theory and practice of breeding, feeding, care and management of farm animals.

Animalia—The animal kingdom.

Animal Kingdom—All animals collectively.

Animal Manure—The fecal excretion of animals with or without litter.

Animal Oil—A complex oil obtained by the distillation of animal substances, as bones.

Ankle—The joint between the foot and the leg, called the hock in many animals, as the horse and cow.

Annatto—Commonly called butter color. A red or yellowish red vegetable pigment or dye, prepared in oil or aqueous solution for coloring butter, cheese and ice cream. It is obtained from the fleshy seed pod of the annatto tree (*Bixa orellana*), a native of tropical America. See Butter Color.

Anneal—To subject to high heat and then cooling for the purpose of softening and rendering less brittle, as glass, brass, steel.

Annona—The agricultural produce of a year; hence, provisions.

Annual—A plant which grows from seed, attains its growth, flowers and produces seed in a growing season, then dies, having completed its life cycle.

Annual Ring—Any of the rings seen in cross section of the stems of most trees and shrubs, marking the annual growth in diameter and consisting of the alternating spring and summer wood formed by the cambium.

Anodynes—Remedies that are used to relieve pain. Externally, the following drugs are used for this purpose: Cocaine, menthol, tar, carbolic acid, belladonna, aconite, etc. Some internal anodynes used in veterinary practice are opium, laudanum, chloral hydrate, cannabis indica, and morphine, barbitol, bromides and codeine.

Anorexia—See Diseases in Cattle.

Anther—The part of the stamen in flowers of seed bearing plants that produces pollen.

Anthrax—See Diseases in Cattle.

Antibiosis—The antagonistic living together of two organisms which usually results in the destruction of one or detrimental to its growth. Ex.—in the making of starter, the *S. lactis* bacteria inhibit the growth of *S. bulgaricus*. See Antibiotic.

Antibiotics—Chemical compounds produced by and obtained from certain living cells.

especially lower plant cells, such as bacteria, yeast, and molds, etc. and which are antagonistic to some other forms of life, such as pathogenic forms.

Some of the more common antibiotics are: Penicillin, Streptomycin, Terramycin, Aureomycin, Chloramycin, Bacitracin, Polymyxin, Tyrothricin (Gramicidin-Tyrocidin), Magnamycin (Carbomycin), Ilotycin (Erythromycin), Dichlorahystreptomycin.

See Milk Contamination by Antibiotics and Pesticides.

Antibody—The substance produced in the animal body against an antigen and exerting a specific antagonistic influence on the substance which stimulated its formation.

Anti-enzyme—A substance which inhibits the action of enzymes.

Antifreeze Solutions—Commonly, a solution which has a freezing point lower than 32° F. at sea level.

There are a number of commercial ones on the market.

Antigen—A substance that has the power of inducing the formation of antibodies in the animal organism under suitable conditions.

Antihemorrhagic Vitamin—See Vitamin K.

Antiknock—A substance added to fuel for internal combustion engines to prevent detonation before the spark plug starts the combustion process.

Antimycotic Agent—A chemical which prevents mold growth on the cheese surface. Some of these agents which have been used are: Sorbic acid, methyl bromide, sodium propionate, propionic acid, dehydroacetic acid, di-methyl di-chloro succinate and antibiotics such as penicillin and aureomycin.

Antineuritic Vitamin—See Vitamin B₁ or Thiamin.

Antioxidants—Antioxidants are chemical inhibitors of the deterioration of fats by atmospheric oxidation. Substances which inhibit the development of "oxidized" flavor, often a troublesome defect in ice cream. They are successful only when added before the objectionable flavor develops. Several substances are known to have this effect such as oat flour products.

Antipellagic Vitamin—Nicotinic Acid or Niacin. One of the Vitamin B₃ Complex.

Antipyretics—Substances used to bring about a reduction of temperature in fevers.

Antirachitic Vitamin—See Vitamin D

Antiscorbutic Vitamin—See Vitamin C

Antiseptic—Any substance which will inhibit the growth of microorganisms without necessarily destroying them. At certain dilutions for example corrosive sublimate is an antiseptic to certain organisms a disinfectant to less resistant organisms and inert toward the highly resistant organisms. See also Disinfectant or Germicide

Antispasmodics—Remedies used to allay spasms or cramps. Some anodynes are useful as antispasmodics. In addition to these hot and cold applications friction liniments and other counter irritants are found effective

Antistertility Vitamin—See Vitamin E.

Antitoxin, (Antitoxine)—Any of certain complex soluble chemical compounds probably of proteid nature occurring in the blood (either normally or under certain special conditions) that have the power of neutralizing some specific poison: an antibody formed in the blood as the result of the introduction of a toxin. Horses are often injected with gradually increasing doses of a toxin in order to develop an antitoxin serum for use on humans or other animals

Antixerophthalmic Vitamin—See Vitamin A

Anus—The posterior opening of the alimentary canal.

Anvil—A heavy block usually iron or steel of characteristic shape on which metal may be shaped by hammering or forging

Apex—The growing point of stem or root

Aphrodisiac—Certain drugs or foods which produce sexual desire in animals

Aphtae—Pearl colored specks or flakes on the lips in the mouth, udder or hoof of cloven hoofed animals which occur when an animal has foot and mouth disease

Aphthous Fever—See Diseases in Cattle

Apogamy—A type of asexual development characteristic of certain plants leading to pure lines or clones

Apparent Acidity—The titratable acidity of fresh milk. See Titratable Acidity

Appenzell Cheese—See Cheese

Appetency—The longing of tissues for that which nourishes them desire appetite

Appetitos—See Cheese

Apple Pectin Pulp, Apple Pomace; Apples—See Feeds and Feeding

Appraiser—One vested with authority to determine the value of property

Approved Dam—An award given by the Ayrshire Breeders Association to an Ayrshire cow that meets certain qualifications as to production and that has a certain number of daughters that have produced a specified amount

Present specifications are that a cow have three daughters that average 92.0 lb of milk and 370 lb of fat with a test of 3.9% or an average of 10,000 lb of milk and 400 lb of fat. Two daughters will qualify a dam for this award if they average 9.00 lb of milk and 360 lb of butterfat with a test of 3.9%.

Approved Sire—An award given by the Ayrshire Breeders Association to a sire when he has at least seven unselected daughters out of tested dams who have met certain production requirements. This is approved for production

When a sire has ten or more daughters classified with an average score of 82.5% for type he is designated as approved for type provided at least 50% of his daughters over three years of age have been classified

When a sire is approved both for production and type he is designated as a Double Approved Sire

Aqua Ammonia—A solution of anhydrous ammonia in water. Aqua ammonia is used in refrigerating machines of the absorption type and generally contains 29½% ammonia

A R.—See Advanced Registry

Arable—Fit for plowing or tillage. Capable of producing crops. Arable land

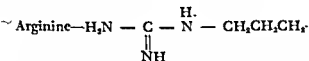
Arachidic Acid— $C_{20}H_{40}COOH$. A non volatile saturated fatty acid present in butter fat to the extent of about 1%

Arachidonic— $C_{20}H_{38}COOH$. A naturally occurring polyunsaturated fatty acid which is essential for animal nutrition found in butterfat

Arc—A light formed in the shape of a bow or arc under certain conditions when an electric circuit is broken

Arc Weld—To join materials by welding where the metal used for making the joint is melted from a rod which may be held in an electric arc formed between the part being welded and a separate graphite electrode. The part being welded may itself serve as the electrode.

Arena—An open space where cattle are shown.



CH(NH₂)COOH. An important basic amino acid present in many proteins. Casein contains about 4.1 gms. and B-lactoglobulin about 2.9 gms. per 100 gms.

Arid—Without much moisture; with insufficient rainfall for much agriculture; without some type of irrigation.

Arlstate—Possessing an awn.

Arm—That part of an animal resembling the arm of a person. That part between the shoulder and the wrist or hock.

Armature—That part of a dynamoelectric machine carrying the conductor, usually made of soft iron.

Armayir Cheese—See Cheese.

Armsby Feeding Standard—See Feeding Standards.

Arnauten Cheese—See Cheese.

Arnold Test—See Dairy Tests.

A. R. O.—Advanced Registry Official. See Advanced Registry.

Aroma—A distinctive, pleasant odor of certain plants and other substances; as the aroma of new mown hay, or the aroma of flavoring materials in dairy products.

Artesian Well—A well made by boring into the earth until water is reached which flows automatically, from internal pressure, like a fountain.

Artificial Butter Flavors—See Butter.

Artificial Cream—See Milk and Cream.

Artificial Food—Chemically or mechanically prepared food, for humans or animals; examples of animal foods are oil cakes and bone meal.

Artificial Insemination—The injection of mechanically procured semen into the fe-

male's genital organs without coition on the female's part. This is accomplished by the aid of mechanical or surgical instruments.

"Artificial Insemination of Dairy Cattle"—See Handbook section P. 31.

Artificial Insemination Organization—These are local cooperative breeding organizations which may be privately owned and operated and central or federated organizations which may be statewide, either cooperative or privately owned. In the latter organization all the work is done in central headquarters and here the bulls serving the entire area are housed.

Artificial Selection—The process of modifying organisms through selection by man of particular individuals to serve as parents of future generations.

"Artificial Stomach"—Mechanical device used to simulate conditions in the human stomach. Coagulant consists of .1N HCl + .45% pepsin heated to 95° F. Actual stomach conditions are reproduced to learn the rapidity and the degree of the digestion of various types of milk, boiled, homogenized, condensed, etc.

Artificial Vagina—A device used for collection of semen, simulating the female vagina. It consists of a double-walled tube, the outer heavy and rigid, the inner thin and flexible, between which walls warm water under pressure is introduced. A rubber funnel and collecting tube at one end serve to retain the semen ejaculated into the vagina.

Artificially Bred—Term commonly used to designate offspring produced by means of artificial breeding.

Asadero, Oaxaca—See Cheese.

Asbestos, also Asbestus—A mineral unaffected by fire, hence used for its fire proofing, non-conducting, and chemical resistant properties.

Ascomycetes—A class of fungi which includes molds and yeasts.

Ascorbic Acid—Vitamin C. See Vitamins.

Aseptic—Freed from pathogenic micro-organisms.

Aseptic Filling—A term used in connection with the filling of sterilized sweet milk and sweet cream cans or bottles. The entire machine is sterilized under pressure and the sealing is accomplished by means of a

cap sealer to bottles or cans in an atmosphere of steam

Asexual—Having no sexual forms as an asexual spore

Asexual Reproduction—Reproduction which does not involve the union of germ cells of two different sexes. It includes cell division spore formation fission budding etc

Asexual Spore—Spores which reproduce by cell division on within the mother cell. There is no union with another cell

Ash—(Mineral Matter) The inorganic or mineral matter of a substance which remains after incineration

The ash of milk is usually determined by incineration at a temperature not higher than 500° C. It amounts to about 0.70% of the weight of the milk and consists principally of oxides sulfates chlorides and phosphates of calcium magnesium sodium and potassium

Asiago—See Cheese

Asin Water—See Cheese

Aspartic Acid— $\text{HOOC-CH}_2\text{-CH(NH}_2\text{)COOH}$. An amino acid present in milk proteins. Casein contains about 7.1 and β -lactoglobulin about 11.4 gms/100 gms

Asphalt—A brown to black solid bituminous substance used in roofing road building paints varnishes etc. It is obtained as a residue from petroleum coal tar lignite tar etc. The petroleum product is artificial asphalt mineral pitch

Aspirator—An arrangement for aspirating or drawing a current of air or any other gas by suction through a liquid

Asses Milk—This milk is very similar to human milk in chemical composition. See Milk Composition of

Assimilation—In plants the incorporation of food materials into the protoplasm

In animals and humans the transformation of food into living tissue

Associative Action of Bacteria—The combined action of two or possibly more organisms in producing a change which cannot be produced by one of the organisms alone. The effect of organisms working in combination is particularly important in dairy products and may influence the amount of acid produced the development of ropiness color production volatile acid production flavor and aroma development etc.

A.O.A.C.—Association of Official Agricul

tural Chemists. This Association publishes *Official Methods Of Analysis*

Recent address Association of Official Agricultural Chemists P.O. Box 540 Benjamin Franklin Station Washington 4 D.C.

Astringents—Agents which cause constriction of tissues used to check bleeding and to reduce secretions

Chalk alum tannic acid boric acid iodiform and bismuth are the most frequently used astringents in veterinary practice

Atavism—The recurrence in an offspring of the characters of a remote ancestor not present in the immediate ancestors

See Reversion

Atlas Powder—A blasting powder or dynamite composed of nitroglycerin wood fiber sodium nitrate and magnesium carbonate

Atmospheric Pressure—Pressure of air enveloping the earth normally 14.7 lb per square inch at sea level or 29.92 inches of mercury as measured by a standard barometer

Atom—The smallest part of an element which can participate in ordinary chemical changes. The atoms of a given element are unvarying in average mass but are different in such mass from atoms of all other elements

Atomic Weight—Atomic weight is the relative weight of the atom on the basis of oxygen as 16. If these weights are expressed in grams they are called gram atomic weights

Atresia—See Diseases in Cattle

Atrophied Quarters of Udder—Underdeveloped quarters of the udder often caused by disease such as a severe case of mastitis. Milk secreted from such quarters is usually abnormal in composition and the chloride content is high enough to give the milk a salty flavor

Atrophy—A gradual shrinkage in size or development either due to lack of nourishment or disuse of an organ of either an animal or plant

Attenuation—A term used by bacteriologists to signify the weakening of bacterial virulence or infectivity and by brewers to indicate the weakening of worts by fermentation of the contained sugars

Auction Sale, (Cattle)—A very popular method of selling cattle is the auction. There are three types of auctions namely—

Dispersal Sale—where the breeder or dairyman sells his entire herd

Reduction Sale—held to reduce the number of animals in the herd.

Consignment Sale—conducted by a group of breeders to sell cattle selected from the herds of the members of breed associations.

Sale of Cull Animals—held to give buyers and sellers an opportunity to buy and sell cull animals under competitive bidding.

Auger—Quite commonly referred to as a tool for taking a soil sample.

In carpentry work, commonly known as a bit and brace.

Autoremycin—See Antibiotics.

Auricles—Small lobes or ears at base of leaf blade, actually appendages to the blade, usually clasping or hornlike.

The upper chambers of the heart which receive the blood from the veins.

"Austenitic" Steel—An alloy composition of about 18 parts of chromium and 8 parts of nickel alloyed with steel.

Australian Salthush—See Feeds & Feeding.

Autocoids—Chemical internal secretions of the ductless (endocrine) glands. These secretions pass directly into the circulatory fluids and are carried to other parts or organs of the body on which they act very much like a drug. They are responsible for the growth impulse in man and animals.

Autocoids are of two classes:

1. Hormones which stimulate metabolic processes and
2. Chalone which depress metabolic processes.

The best known of the ductless glands are the thymus, thyroid, parathyroid, pituitary, pineal, adrenal, pancreas, testes, ovaries and the placenta during pregnancy.

Authenticated Record—A milk and butterfat record of a cow or herd that has been supervised for a Breed Association by a representative of an agricultural college or experiment station.

Authenticated Test—See Official Record.

Authorities Controlling Milk—Certain regulations for sanitary milk production and distribution are laid down by the U. S. Department of Health and by state departments of health and departments of agriculture. Nearly all cities have health departments, all of which should be consulted.

For details on "Requirements For the Sanitary Production of Milk or Cream," see article on this subject in the Handbook section, P. 60.

Autoclave—A sterilizing apparatus consisting of a chamber into which steam, under pressure, is introduced as the sterilizing medium. Used for sterilizing laboratory equipment and media. Example: a pressure cooker.

Autointoxication—A term indicating self-poisoning generally due to improper elimination and/or the absorption of toxins developed within the body.

Automatic—Having a self-acting or self-regulating mechanism that performs a certain operation usually performed formerly by hand.

Automatic Cappers—A device attached to an automatic bottling machine so that when a bottle is filled it is immediately capped.

Automatic Machine—A machine or tool, that, when set, operates automatically except for power, lubrication, etc.

Automation—A comparatively new word which refers to the development of processes which make it possible to eliminate human labor by machines and controlled circuits in such a manner as to enable a job to be carried to completion with a minimum of human labor, skill and judgment.

Auto-oxidants—Materials which accelerate auto-oxidation.

Auto-oxidation of Fat—To oxidize by direct combination with oxygen at ordinary temperatures.

Autosome—Genetics. Any chromosome other than the sex chromosome.

Autotrophic—Capable of utilizing carbon dioxide as a source of carbon and of obtaining energy for the reduction of carbon dioxide and other life processes from the oxidation of inorganic elements or compounds, e.g. sulfur, hydrogen, ammonium, and nitrite salts, or from light.

Autumn Mange—See Diseases in Cattle.

Avenex—A cereal (oat flour) by-product used as an antioxidant for dairy products. The product is manufactured by the Quaker Oats Company and Avenex is its trade name.

Avitaminosis—See Diseases in Cattle.

AVMA—Is the abbreviation for American Veterinary Medical Association

Avoset—See Milk and Cream

Awl—A pointed instrument for making small holes as in leather Awls are shaped differently for different uses

Awn—A stiff hair or bristle, frequently barbed attached to the tip, back, or base of an organ Frequently occurs on one of the chaffy bracts of the grass spikelets and is commonly called a beard

Awnless—Having no awns or beards

Axil—Angles formed by the junction of leaf and stem

Axis—Central stem of plant

Axle—The pin or spindle on which a wheel revolves or which revolves with the wheel

Axle Nut—The bushing in the hub of a wheel through which the axle passes

Axle Tree—The part secured to an axle, not rotating but having bearings on which the wheels revolve

Ayrshire—A breed of red and white dairy cattle, originating in Scotland They are medium in size, (average 1100-1200 lb) hardy and good milk producers Their milk is especially useful for market milk and for cheesemaking See fliandbook

Ayrshire Breeders' Association—An association of breeders of the Ayrshire breed of dairy cattle whose purpose is to develop and promote the breed Their headquarters are at Brandon Vermont

Azofication—Nonsymbiotic fixation of atmospheric nitrogen in the soil by bacteria See Azotobacter

Azoted—Nitrogenous nitrogenized

Azotobacter—A genus of large rod-shaped or spherical nonsymbiotic bacteria occurring in soil and sewage, which fix atmospheric nitrogen in the presence of carbohydrates and derive growth energy from oxidation of carbohydrates

B

Babassu Oil Meal—See Feeds & Feeding

Babbit Metal—An alloy metal, white in color containing copper, antimony and tin, antifriction in property Used to line bearings

Babcock Tests For Fat—In Cream Homogenized Milk, Ice Cream Milk, Skim Milk and Buttermilk See Dairy Tests

Babcock Tester—The apparatus in which the bottles are centrifuged in performing the Babcock test See Dairy Tests

Babesia—A genus of minute parasites which live in the blood of certain livestock, especially cattle causing Texas fever Transmitted by ticks and biting insects

Baby—A very young animal of either sex.

Baby Beef—A young beef animal that has been rapidly fattened while still in the rapid growth period. Such animals generally go to market for slaughter at from 12 to 20 months of age and weigh from 7 to 12 cwt live weight. Aberdeen Angus and Herefords are the most popular breeds for this trade

Also, the trade name for this type of meat

Bacilli—A large group of gram positive, aerobic, rod-shaped bacteria which are distinguished from other bacteria by the presence of spores They contain both harmless and pathogenic species

Bacillus Polymyxa—This organism has been found to cause an early gas defect in Swiss cheese

It is found in water, soil and sewage and is the source of the antibiotic polymyxin

Bacitracin—See Antibiotics

Back—In animals, the upper part of the body, from the neck to the end of the spine In plants the under (dorsal) surface of a plant organ as the underside of a leaf

Back Pressure—The suction pressure carried on the low pressure side of a mechanical refrigerating system

Backsteiner Cheese—See Cheese

Bacteria—A large group of microorganisms, found in air, water, soil, the bodies of living animals and plants, and dead organic matter Cells may occur singly or in large colonies and usually appear either as spherical cells rod shaped cells or spiral threadlike cells

Popular term—microbe or germ
See Dairy Microbiology

Bacteria, A Comparison of Size of—How big is a microbe? Everyone who works with them marvels at their smallness. One way for arriving at some conception of their size is to compare them with objects familiar to us. Here is an apt comparison given by Dr. Bayne-Jones, the author of *Man and Microbes*:

"Suppose 25,000 soldiers of a modern American infantry division were formed up in a single rank with an allowance of 18 inches for each man. This line would be about $7\frac{1}{4}$ miles long. Suppose, next, that some omnipotent general officer from headquarters should command "Dwindle," and that at the word of command each soldier would shrink to the width of an average bacterium, 1 micron, and close up on his neighbor. Their line would then be about 1 inch long. Twenty-five thousand typhoid germs could lie comfortably side by side in an inch."

Dr. Bayne-Jones also tells us in this same book that, "A microbe with a volume of 1 cubic micron and specific gravity of 1.2 would weigh 0.000000012 milligram. This means that it would take about 833 million microbes of this size to weigh 1 milligram. As there are 1,000 milligrams in a gram and about 28.3 grams in an ounce, 28,300 times 833 million of these microbes would be needed to balance an ounce weight."

Bacteria Count—A term used to express the number of bacteria estimated by standard laboratory methods to be present in one cubic centimeter, or one gram, of a food substance. This term may refer to either plate counts or direct microscopic counts.

Bacteria, Growth of—In controlling the growth of bacteria one should remember that moisture, warmth and desirable food material in the right form are factors which influence their growth.

Unfavorable conditions for bacteria are high heat, high acidity and high sugar concentrations.

Strong alkali solutions such as chlorine compounds are used for disinfecting purposes.

Bacteria, Soil—Bacteria which can live and multiply in soil and are responsible for such functions as nitrogen fixation, nitrification, oxidation of iron and sulfur, etc.

Bacterial—Pertaining to, consisting of, or resulting from, bacteria.

Bacterial Cultures for Silage—For some time it was thought that desirable fermentations

in silage could be induced by certain bacterial culture. However experiments seem to indicate that the use of bacterial culture is of no particular value as regards the making of silage.

Bactericidal—A general term for anything that has a killing effect on bacteria. In dairy practice, pasteurization and chlorine and sunlight and quaternary ammonia are among the most important bactericides.

Bactericidal Agents in Milk—While little understood, it seems definitely proven that milk in the udder or freshly drawn contains substances which retard the growth of bacteria. Colostrum milk, it is thought, contains enough anti-bodies of bactericidal qualities to give the new born calf significant immunity.

Bactericide—An agent which destroys bacteria.

Bacteriological Grading of Milk—This grading of milk was formerly stressed to a considerable degree but is now considered of minor importance. Obviously it is not the number of bacteria but the kind that is of importance from a health point of view. The keeping quality while important can be overemphasized. It is important to know that there are no pathogenic germs or mastitis, that cleanliness has been observed in production and that there has been no bacterial contamination during processing, subsequent handling or distributing the milk.

Bacteriological Openings in Cheese—See Cheese Defects (Texture).

Bacteriology, Dairy—The science that deals with the study of bacteria as related to the dairy industry.

See list of bacteriology books in Reference section of Handbook.

Bacteriophage, (commonly phage)—A virus which attacks and destroys bacteria. The virus generally has great specificity for a certain strain of bacteria. The result of this contamination results in slow or no acid production. The mist from a whey separator is thought to be a source of contamination and dissemination in the plant.

Bacteriophage Control:

1. Plant cleanup.
2. Renew cultures.
3. Rotate cultures.
4. Preventing the milk from coming into contact with air, particularly from the separator.

Bacteriostatic—A term applied to substances that will prevent growth in bacteria or hold them in check. It does not infer effectiveness in killing bacteria.

Bacterotoxin—Soluble thermostable, poisonous substances produced by bacteria.

Bacterium—One of a large group of microorganisms widely distributed throughout the soil, air and water. Certain types are parasitic on plants and may be beneficial (nitrogen fixing bacteria) or detrimental (disease bacteria) in their action.

Bacterium Casei—A bacterial species important in the dairy industry. Readily isolated from milk and cheese, and soil. This bacteria is the same as *Bacillus cereus var. Mycoides*, a gram positive, spore forming, aerobic bacteria. More recently classed as *Lactobacillus casei*.

Bacterium Linens—An important bacteria responsible for ripening of Limburger cheese. It grows only on the surface of cheese and produces enzymes that diffuse into the cheese and digest the proteins with development of the strong flavor typical of Limburger.

Bacterium Protolyticum—A causative organism of stinker Swiss. When the milk used for Swiss cheese contains as much as ten of these organisms per milliliter, an odoriferous fermentation occurs. Where there is greater infection the cheese shows a high pH, a bad odor and greyish dark spots and some gas development.

"Bacterol"—A proprietary liquid antiseptic containing formaldehyde associated with small proportions of other substances.

"Bactox"—A powerful proprietary fluid antiseptic and germicidal disinfectant made from certain phenoloids, in a form miscible with water.

Baffle Boards, (Brakes)—See Cheese.

Baffle Plate—A shield placed at a certain specified position or angle for the purpose of deflecting one substance from another, or in some cases, aiding in mixing various substances.

Bag—A sack, pendant or fold of skin enclosing a gland or other organ, as the udder of a cow, or the scrotum.

Bag Filter—A cloth bag placed over a metal frame in a drum type container through which milk is forced for filtering purposes.

Bagasse—See Feeds & Feeding.

Bagging Up—The practice of allowing a cow to go un milked for one to four milkings with the result that the udder becomes greatly distended. This is often done with animals before they are brought into the show or sale ring. It is a dangerous practice, however, if carried too far, as it may cause injury to the inside of the udder.

Bagozzo or Grana Bagozzo—See Cheese.

Bahia Grass—See Feeds & Feeding.

Bail—A bar or pole separating the stalls of an open stable, a kind of frame, or stan chion for confining the head of a cow, as at milking time.

Baker's Cheese—See Cheese.

Baking Soda—See Sodium Bicarbonate.

Balance—In biochemistry, the relation of the amount of food consumed to the amount of waste excreted. Also an instrument for determining the relative weights of a substance.

Balance Sheet—A paper showing a tabular statement of the balances of the accounts of a business, the debit and credit balances footing up equal.

Balance Trial—An experimental feeding to determine whether an animal is storing or losing nutrients. If for example, more calcium is secreted and excreted by an animal than it consumes in its feed, the calcium must come from its own body, indicating a negative calcium balance. If however, it receives more calcium from its feed than it gives off it is in a positive calcium balance. Animals show a positive balance when putting on weight, and a negative balance when losing weight.

Balance Wheel—A wheel to balance or regulate motion, a flywheel.

Balanced Ice Cream Mix—See Ice Cream.

Balanced Method—See Ice Cream.

Balanced Ration—A balanced ration is the feed or combination of feeds that will supply the daily nutrient requirements of an animal. The dairy cow requires feed for the following purposes:

- 1 for maintenance of the body
- 2 for the production of milk.
- 3 for growth (when immature)
- 4 for the development of the fetus (when pregnant)
- 5 for gain in weight (when thin)

The two main considerations, however,

are for maintenance and milk production. During the last 6 to 12 weeks before freshening, cows usually are given extra feed, partly for growth if the animal is immature, partly for the growth of the fetus, (most of its growth takes place at this time), but largely for gain in weight since an animal should be in good flesh at the start of her lactation. The requirements of individual animals differ since the nutrients required for maintenance vary with the size of the animal and the requirements for milk production vary with the amount and richness of the milk produced.

The nutrients which are considered in the balancing of a ration have been, in the past, digestible protein and total digestible nutrients or energy. Considerable information now exists as to the requirements of the animal for calcium, phosphorus, and carotene. The minimum requirements of certain other minerals and vitamins are also known, and so the scope of feeding balanced rations is widened.

Tables have been worked out which give the requirements of animals of different sizes for maintenance, and for the production of milk with different percentages of fat. By knowing the weight of the animal and the amount and test of her milk, it is easy to figure her daily requirements. After the requirements are ascertained, it is necessary only to apportion the feeds so that they will supply these requirements, with due regard to the characteristics of the various feeds.

Briefly, a balanced ration is a ration which furnishes the various nutrients required by the animal in such proportions and amounts as will properly nourish it for a period of twenty four hours.

Balanced Rations & Calculating Feed Requirements—See Handbook section, P. 11.

Bale—To compress, usually in a machine, and tie with wire or twine, as a bale of hay. There are square and round bales and many different types of machines now available from farm implement manufacturers.

Ball and Socket Joint—The hip joint. Also any joint in which a ball moves within a socket to permit movement in every direction.

Ball Bearing—A bearing which turns upon hardened steel balls. These roll easily and convert sliding friction into rolling friction; also, any of the balls.

Ball Compressor—See Cheese.

Balling Gun—An instrument with a cup-shaped depression at one end for placing solid medicine in the form of a bolus or ball or capsules containing liquid in the posterior part of the mouth of a cow, horse or other animal so that it will have to be swallowed without mastication.

Banbury Cheese—See Cheese.

Band Pulley—Also belt pulley. A broad-faced pulley designed to carry a flat belt.

Bandager, (Canadian)—See Cheese.

Band—To put a band or mark on an animal, as a mark of identification.

Any device or material placed around a tree to prevent insects from crawling up the trunk. Bands are of no value against flying insects.

Banding in Cheesemaking—See Cheese.

Bang's Disease—(Brucellosis, Contagious Abortion, Infectious Abortion.)

See Diseases in Cattle.

Bank Barn—A barn built against a hill, where there is a ramp to the second floor, usually of earth.

Barbed Wire—A wire or a strand of twisted wires, armed with barbs or sharp points. It is commonly used for fences.

Barbery Cheese—See Cheese.

Barley; Barley Bran or Hulls; Barley Feed; Barley Mixed Feed—See Feeds & Feeding.

Barn—A building commonly used for housing livestock, (cattle and horses), their hay, grain, bedding, and often some machinery.

Barn Book—A book used by a milk tester at the barn in which he keeps a record of feed consumed by cows, production records, breeding dates, and other pertinent data.

Barny—Like a barn; as in shape, smell, etc.

Barny Flavor—See Milk & Cream Defects.

Barometric Jet Condenser—See Milk, Condensed & Evaporated.

Barrel—As applied to dairy cattle, that part of the animal's body between the fore and rear legs. The trunk of any quadruped. Sometimes known as the *middle*.

Barrel Churn—See Butter.

Barren—Incapable of producing offspring sterile. May mean male or female, though female is usually meant. Also said of plants or unproductive soil

Barrow—A platform having handles, with or without wheels on which a heavy or bulky object may be moved by hand

A male hog which was castrated when young

Barrow Truck—A two wheeled truck used to move bags, etc.

Basal Metabolism—The heat output of an individual, not asleep but resting in bed at a room temperature of about 24° C (75.2° F) for twelve hours or more after he has had his last meal. It represents the energy expended to maintain respiration, circulation, peristalsis, muscle tonus, body temperature, glandular activity and other vegetative functions

The basal metabolism of normal men is about 950 calories per square meter of body surface per 24 hours

Base, (Chemical)—A substance which in solution can accept protons (H^+). Many common bases are substances which form hydroxyl (OH^-) ions in solution, the latter being capable of combining with protons to form water. Such bases are classified as strong or weak on the basis of their degree of dissociation to form hydroxyl ions. Sodium hydroxide is an example of a strong (completely dissociated) base, ammonium hydroxide of a weak base.

Base—In Ice Cream Making, the combination of chief ingredients to which special ingredients may be added to give a variety of flavors, colors, etc.

Basebred—Of low origin, breeding or nature

✓ **Base Exchange**—See Cation Exchange

Base Exchange Treatment—See Ion Exchange Treatment.

Base-free Casein—See Uncombined Casein

Base Ice Cream Mix, Base Ice Mix, Flavor and Color Mixture for, Base Ice Mix, Preparation of, Base or Stock Ice Mix.—See Ice Cream.

Basic Slag—A calcium phosphate-silicate by product of the steel industry used as a fertilizer material. It contains varying amounts of lime and from 15 to 25% phosphoric acid

Basic Surplus Plan—A plan for buying milk whereby the producer is assigned a definite volume of production. For amounts over and, in some cases, under this basic volume he receives the surplus price, which obviously is lower than that received for his basic volume—See "Open" Base Plan and "Closed" Base Plan

Basket Stirrers—See Cheese

Batch—The quantity of anything produced at one operation—as a batch of cheese; a batch of milk.

Batch Heater—See Milk Processing and Processing Equipment

Batch Holders, (Pasteurizers)—See Milk, Processing and Processing Equipment

Battery—An apparatus used to generate voltaic electricity, consisting of one or more cells

Battlemat Cheese—See Cheese

Banden Cheese—See Cheese

Baudouin Test—See Dairy Tests

Baumé—Relating to the scales on the Baumé hydrometer an instrument for determining the density or specific gravity of liquids especially and sometimes of solids. There are two Baumé hydrometers, one of which is used in liquids heavier than water and one used in liquids lighter than water

Baumé Hydrometer, (graduated for sugar solutions)—An hydrometer used to measure the density of sugar solutions, based on the weight of material in solution. It indicates the percentage of saturation

Bawl—A loud prolonged bellow; as a cow. A loud, full sound.

Bean Pods—See Feeds & Feeding

Bear—A stock market term applied to one who feels price trends will be lower as in commodities, securities and stocks on the Market Exchanges.

One who sells short expecting to buy later at a lower price

Bearded—Bearing long hair in tufts over small areas

Bearing—The bringing forth of offspring or fruit.

A part of a machine in which a journal shaft, or pin, revolves

Bearing Metal—Metal for bearings, brass, bronze, or some other anti-friction metal.

Bears—In marketing, speculators who are working to depress prices.

Bedding—Material such as straw, sawdust, etc. used in stables to promote cleanliness and absorb liquid manure.

Bedding for Calves—Ideal bedding for young calves should consist of clean, dry wheat or oat straw, or shredded corn stover in ample amounts to keep calves dry. Clean shavings or sawdust may also be used.

Beef—The meat derived from cattle nearly one year of age, or older.

Beef, Carcass—*

PRIME

Prime grade beef carcasses and wholesale cuts are blocky and compact and very thickly fleshed throughout. Loins and ribs are thick and full. The rounds are plump and the plumpness extends well down toward the hocks. The protrusion of fat between the chine bones is liberal and the overflow of fat over the inside of the ribs is abundant and fairly evenly distributed. It has abundant marbling and the marbling is extensive especially in the heavier carcasses. Carcasses must also be symmetrical and uniform in contour and the rib eye muscle must be fine in texture.

A carcass must have certain evidences of quality to be eligible for the Prime grade. Slightly abundant marbling must be evident in the rib eye muscle of carcasses with soft, red chine bones terminating in soft pearly white cartilages. Progressively more marbling is required in carcasses with evidences of more advanced maturity. Only beef produced from steers and heifers will qualify for the Prime grade.

CHOICE

Choice grade beef carcasses and wholesale cuts are moderately blocky and compact and moderately thick-fleshed throughout. Loins and ribs are moderately thick and full and the rounds are moderately plump. The fat covering of beef within the grade will vary within moderate limits depending on evidences of the maturity attained by the animal from which it was produced. Interior and exterior fats are fairly firm and brittle. In carcasses whose chine bones are tinged with white and which terminate in cartilages in which some ossification is evident, the rib eye has moderately abundant marbling and is usually moderately firm and fine in texture. The color of the muscle usually ranges from a light red to slightly dark red. It is usually uniform and bright in color but may be slightly two-toned or slightly shady.

Carcasses showing evidences of maximum maturity permitted in the Choice grade have chine bones which are tinged with white and cartilages on the end of the chine bones which are partially ossified. However, the carcasses must also be at least moderately symmetrical and uniform in contour and the rib eye muscle must be fine in texture.

The minimum marbling permitted will vary from a small amount in very red-boned, light-

weight carcasses to a moderate amount in carcasses approaching the maximum maturity permitted. Carcasses which are slightly compact and blocky and with slightly plump rounds and slightly thick fleshing may meet the minimum requirements for the grade provided they have finish and evidences of quality equivalent to the midpoint of the Choice grade.

Beef produced from steers, heifers, and young cows may qualify for the Choice grade.

GOOD

Good grade beef carcasses and wholesale cuts are slightly compact and blocky in conformation and the fleshing tends to be slightly thick throughout. Loins and ribs are slightly full and the rounds are only slightly plump. Chucks are slightly thick and full and the neck and fore shanks tend to be slightly long and thin. The fat may be somewhat soft or slightly oily. Characteristics of the cut surface of the rib eye muscle will vary depending on evidences of maturity attained by the animal from which it was produced. In carcasses whose chine bones are soft and red and which terminate in soft, pearly-white cartilages the rib eye has a slight amount of marbling and is usually moderately soft but fine in texture.

Carcasses showing evidence of maximum maturity permitted in the Good grade may have chine bones tinged with white and the cartilages on the end of the chine bones may be moderately ossified. Carcasses must also be at least moderately symmetrical and uniform in contour and the rib eye muscle must be at least moderately fine in texture.

COMMERCIAL

Beef qualifying for the Commercial grade is quite variable in conformation, finish, and quality and in the evidences of maturity attained by the animal from which it was produced. Young, red-boned carcasses are rangy, angular, and slightly thin-fleshed throughout. Loins and ribs tend to be flat and are slightly thin-fleshed. The rounds are moderately flat and tapering. Chucks are slightly flat and thinly fleshed. Such beef will have only a thin covering of external fat over the loins and ribs, practically no protrusion of fat between the chine bones, and very scanty quantities of over-bow fat and feathering. The cut surface of the rib eye muscle of such beef is somewhat soft and watery but fine in texture and will have little, if any, marbling. The fat is moderately soft or oily.

Carcasses from mature animals with conformation and evidences of quality which only slightly exceed the minimum requirements of the grade are not eligible for the Commercial grade if they are excessively patchy or uneven in distribution of external fat.

UTILITY

Utility grade beef carcasses and wholesale cuts may be decidedly rangy, angular, and irregular in conformation. The fleshing is usually thin. The loins and ribs are flat and thinly fleshed. The rounds are long, flat, and tapering.

The Utility grade of beef may be produced from steers, heifers, or cows.

CUTTER

Cutter grade beef carcasses and wholesale cuts may be very rangy, angular, and irregular in conformation and very thinly fleshed throughout. The loins and ribs are very flat, thin, and shallow. The rounds are very long, flat, and tapering.

The Cutter grade of beef may be produced from steers, heifers, and cows. That produced from cows constitutes a relatively large percentage of the beef eligible for this grade.

CANNER

Canner grade beef carcasses and wholesale cuts shall be extremely rangy, angular, and irregular

*Specifications for official United States standards for grades of carcass beef (steer, heifer, and cow). Condensed from the USDA Service and Regulatory Announcements No. 99.

in conformation and extremely thinly fleshed throughout. All cuts are extremely thinly fleshed.

A very large percentage of the beef of the canner grade is produced from mature cows that are somewhat advanced in age.

GRADE OF BULL BEEF CARCASSES CHOICE

Choice grade bull beef carcasses have excellent quality finish and conformation for the class. Rounds, chucks and neck are thick and are very heavily muscled. Loins and ribs are broad but tend to shallowness and are relatively small in proportion to the rest of the carcass. Usually such carcasses are derived from young well fed bulls although sometimes carcasses of older bulls meet the requirements of this grade. The flesh generally is of a medium dark red color firm but comparatively dry.

GOOD

Good grade bull beef carcasses have good quality finish and conformation for the class. All fats are somewhat soft and may be slightly oily. Flesh generally is medium dark red in color moderately firm and dry.

COMMERCIAL

Commercial grade bull beef carcasses possess average quality finish and conformation for the class. The flesh is moderately firm but usually very dry. Its color varies from dark red to light brown.

UTILITY

Utility grade bull beef carcasses although fairly well-developed in the rounds and chucks are deficient in these respects as compared with the higher grades. As a rule interior fats are absent although slight traces may be found around the kidneys. The flesh is dry and very dark.

CUTTER

Cutter grade bull beef carcasses have poor quality and conformation with practically no visible finish. The general outlines are very uneven. Flesh though relatively dry is inclined to be soft. Its color is dark red to light brown.

CANNER

Canner grade bull beef carcasses have extremely poor quality and conformation. Visible finish is generally absent. There are no exterior or interior fats. Flesh is soft and dark.

GRADES OF STAG BEEF CARCASSES CHOICE

Choice grade stag beef carcasses have excellent quality finish and conformation for the class. Rounds are thick full and bulging. Flesh is firm and fine grained for the class and shows some intermixture of fat along the muscle seams. Its color varies from medium to dark red.

GOOD

Good grade stag beef carcasses have good quality finish and conformation for the class. Rounds are moderately thick and full. Loins and ribs are fairly well proportioned and have moderate depth of flesh. Interior fats generally are in moderate supply but may be slightly deficient. The flesh is firm moderately fine-grained, and varies from medium to dark red in color.

COMMERCIAL

Commercial grade stag beef carcasses have fair quality finish and conformation. Rounds although somewhat full and thick are inclined to be tapering. The flesh is usually slightly soft and moist. Its color varies from medium to dark red.

UTILITY

Utility grade stag beef carcasses have poor quality finish and conformation. Rounds are thin and tapering. Loins are thin flat or slightly swollen. Thin patches of fat are usually found

along the back and on the shoulders. Small quantities usually are found in the crotch and around the kidneys. Flesh is soft moist, and dark-colored.

CUTTER

Cutter grade stag beef carcasses are decidedly deficient in quality finish and conformation. All bones are prominent because of deficient flesh and fat covering. The flesh is soft watery and dark-colored. This grade is seldom found on the markets.

CANNER

Canner grade stag beef carcasses are extremely deficient in quality finish and conformation. All bones are very prominent. Rounds are extremely thin and sharply tapering. No visible exterior or interior fats are present. The flesh is dark soft, and watery. This grade is rarely found on the markets.

Beef Cattle—Cattle with heavy rectangular bodies broad level back well covered with flesh short thick necks bred primarily for the production of beef.

Beef Cattle Publications—Publications which are published to promote breeds of beef cattle the principle ones are as follows: American Hereford Journal, Kansas City; Missouri Red Poll News, Lincoln Nebraska; The Polled Hereford Magazine, Montgomery Alabama; Polled Hereford World, 1019 Falls Building, Memphis 3 Tennessee; The Aberdeen Angus Journal, Webster City Iowa; The Shorthorn World, 16 South Locust St. Aurora Illinois.

Beef Extract, (Meat Extract)—An extract of the soluble constituents of beef used in bacteriological media. Also extensively used in foods.

Beefsteak—A beef cut usually from the hind quarter.

Beefy—Tending to be fleshy heavy.

Beet—See Sugar Beet.

Beet Molasses; Beet Pulp, Beet Pulp, Dry; Beet Pulp, Wet—See Feeds & Feeding.

Beet Sugar—See Sugars.

Beet Tops—See Feeds & Feeding.

Beggar Weed—See Feeds & Feeding.

Begot—To procreate as a sire. Now more or less obsolete. Its use possibly stems from the time when the saying "Like begets like" was extensively used.

Bel Paese—See Cheese.

Belgian C

Bell Trap—A sewer trap commonly used in small creameries where large amounts of water pass through at short intervals and where the sewer is not connected with some larger sewer system. The bell trap cannot be ventilated.

Bellelay Cheese—See Cheese.

Belly—The under part of an animal's body, containing the organs of digestion.

Belly Button—The navel.

Belted Cattle—Cattle that have a belt of white around the middle between coal black ends of the body. See Dutch Belted.

Bench Terrace—Terrace with steep drop on the downhill side; used on very steep slopes.

Benedict's Solution—A copper reagent for the detection and determination of reducing sugars, in which the copper is maintained in alkaline solution by means of citrate with which it complexes. Dissolve 173 gm. of sodium citrate and 100 gm. of anhydrous sodium carbonate in about 600 cc. of distilled water by heating. If necessary, filter the solution through a fluted filter paper. Dissolve 17.3 gm. of copper sulfate in about 150 cc. of distilled water. Pour the carbonate-citrate solution into a large beaker, and add the copper sulfate solution slowly with constant stirring; then dilute to one liter. The reagent is then ready for use and does not deteriorate upon long standing.

Benckendorf Overrun Tester—An instrument devised for the testing of overrun in ice cream. It consists principally of a brass cylinder of known capacity. This is used in obtaining the sample. The sample is melted down with a known volume of hot water, the foam is destroyed by ether, and the difference in space occupied by the frozen ice cream and the melted ice cream forms the basis for calculating the yield.

Now more or less obsolete.

Benzoic Acid—A common preservative. Also used for brine rennet solutions in a concentration of about 1% in cheesemaking.

Bergkase—See Cheese.

Bergquara Cheese—See Cheese.

Beri-beri—A nervous disease in man corresponding to polyneuritis in birds. It is caused generally by a lack of vitamin B₁.

Bermuda Grass—See Feeds & Feeding.

Bernarde—See Cheese.

Bersecm Clover—See Feeds & Feeding.

Beta Lactose—Milk sugar in highly soluble form.

Bgug-Panir Cheese—See Cheese.

Bicarbonate of Soda, (In Ice Cream Making)—As a neutralizing agent, bicarbonate of soda (Na H CO_3), baking soda, is very satisfactory. It increases the viscosity less than other neutralizers. is very soluble, affects the flavor very little and is always available.

Biennial—A plant that germinates in the spring of one year and dies in the fall of the following year. A plant that completes its growth cycle in two growing seasons.

Biestings—Colostrum milk. See Colostrum.

Big Neck—See Diseases in Cattle.

Bile—A product of the liver, stored in the gall bladder for distribution as needed through a duct to the small intestine. It is a greenish, golden colored fluid, bitter in taste and alkaline in reaction. It helps to emulsify the fats digested in the intestinal tract by forming soaps through the action of its alkali-salts and the presence of fatty acids. Bile has an antiseptic action in the intestines as well as a stimulating effect on peristalsis.

Bile Salt—Consists of varying amounts of sodium glycocholate and sodium taurocholate. It is used as a liver stimulant and a laxative and also in a media for the culture of coli-bacteria.

Bile Salt Test—Is used to determine the presence of the Coliform group of bacteria in milk. Brilliant green bile salt broth is one of the media used for incubating the organism as other types of bacteria apparently do not develop in the presence of bile salts.

"Billion-Dollar Grass"—See Feeds & Feeding.

Binders—See Stabilizers.

B.O.D. Biochemical Oxygen Demand—The amount of oxygen required to maintain aerobic conditions during decomposition of factory wastes such as whey. The effect of excessive waste in streams is that it uses up dissolved oxygen, thereby creating objectionable conditions and making it impossible for fish to live.

Standard Cheese Losses		per 1000 lb milk
Process	B.O.D.	
Cottage Cheese Making	1060	ppm
American Cheese Making		
Unwashed curd	2250	ppm
Washed curd	3000	ppm
Cheese factory overall	250	ppm
(Am raw milk)		
Cheese factory overall	300	ppm
(Am pasteurized milk)		

Biochemical Reactions—Chemical reactions brought about by systems of living matter e.g. enzymes Fermentation and putrefaction are good examples of biochemical reactions

Biochemistry—The chemistry of plant and animal life biological chemistry

Biogenesis, also Biogeny—The theory that living organisms can be created only by pre-existing living parents Opposite of abiogenesis or spontaneous generation—the theory that life can occur without descent from parents

Biolae, (Borden's)—A liquid modified milk for infant feeding

Biological—Of or pertaining to biology

Biological Assay—Estimation of the concentration of a drug or other substance by comparing its effect on living animals or animal tissue with that of a standard product whose effect is known

Biological Control—The balancing of the forces of nature of their own accord It insects for example become numerous over a period of years natural forces such as birds parasites and predatory insects or fungus diseases increase through favorable food environment and reduce the population to normal or subnormal numbers for a time

Biological Mineralization—The conversion of an element occurring in organic compounds to the inorganic form as a result of biological decomposition Example: Bacteria use the sulfur in some of the amino acids and change it into elemental sulfur The formation of bone and of gall stones in the body are other examples

Biological Survey—A bureau of the United States Department of Agriculture created particularly to investigate and report on American birds and mammals

Biologist—One who studies biology one versed in the science of biology

Biology—The science that treats of living things It includes Botany, embryology genetics morphology physiology zoology and others

Bioluminescence—The giving off of light by living organisms as the result of internal oxidation changes

Biomagnetism—Animal magnetism hypnotism

Bionomics—The branch of biology that deals with organisms in relation to themselves and to their environment

Biophore, also Biophor—The smallest body of matter capable of life

Bioplasm—Protoplasm in a living forming or germinal state More broadly any living matter

Bioplast—A tiny mass of bioplasm in itself a living unit and having formative power

Biorization—A process by which milk is heated rapidly to 167° F (75° C.) and cooled as rapidly This is accomplished by dispersing the milk into fine droplets in a room at 167° F (75° C.) and then cooling in a Liebig condenser It has been claimed that all pathogenic bacteria are absolutely destroyed by this process and that the milk retains raw milk properties Now obsolete

Bios—Animal and plant life organic nature
A term used for a growth factor for yeast

Biota—The animal and plant life of a region

Biotin—See Vitamins

Biparous—In animals bringing forth two young at a birth twins
See parous

Bird-foot Trefoil—See Feeds & Feeding

Birth—Act or fact of being born or coming into life also act of bringing forth Parturition

Birth Canal—The channel for parturition formed by the cervix vagina and vulva

Birth Control—Control of the number of offspring born especially by preventing or lessening the frequency of impregnation

Birth Weights of Calves of the Dairy Breeds—

	Number of	Average Weight of	Average Weight of Dams	Per cent of Dam's Weight
Breed	Calves	lb.	lb.	Weight
Jersey	253	55	867	6.35
Holstein	229	89	1137	7.83
Guernsey	57	71	996	7.03
Ayrshire	80	72	983	6.41
Brown Swiss	5	100	1123	8.90

✓ Bisexual—An animal or plant having the reproductive organs of both sexes, i.e. both ovaries and testes; hermaphroditic.

Bit—A triangular earmark for cattle.

Act of biting; a bite.

A part of a bridle for a horse.

Biting Insects—Those with chewing mouth parts as opposed to sucking insects. Some sucking insects have piercing (biting) mouth parts.

Bitter Chocolate—See Chocolate Liquor.

✓ Bitter Flavor—See Milk & Cream Defects.

Bitter Flavor in Cheddar Cheese—See Cheese Defects.

Bitterweed Flavor—See Milk & Cream Defects.

Bitto Cheese—See Cheese.

Biuret Reaction—A protein test indicated by the peptide linkages. An excess of caustic alkali and a little copper sulfate are added to a sample of the protein to be tested. Proteins give a violet color, and proteoses and other products of hydrolysis a reddish tint.

Bivalent—In Chemistry: Having a valence of two. See Valence.

Bivalent Chromosomes—Biology: A pair of homologous (identical) chromosomes, usually found end to end. See Valence.

Bixin—Annatto or orlean. A coloring used for cheese from the seeds of annatto, *Bixa orellana*. The coloring is a carotenoid.

Black Belt—The belt of soils developed from limestone extending across Alabama and Mississippi. Famous for its grassland.

Blackleg—See Diseases in Cattle.

Blackleg Aggrasin—This is a tissue extract containing the immunity-producing substances which are naturally present in the

tissue of calves dead from acute blackleg. Used to immunize young cattle against blackleg.

Black Medic; Black Strap—See Feeds & Feeding.

Blackout, in cheesemaking—See Cheese.

Blade—Expanded part of leaf. Blade plus sheath make the leaf.

Blanketed Cattle—A name sometimes given to belted cattle. See Dutch belted.

Blastoderm—In embryology, the cells composing the single-layered wall of the hollow sphere or morula (the mass of cells formed by the first cleavage of the egg) later differentiating into three germ layers.

Blaze—A white mark on the face of a horse, cow or other animal, especially a white stripe running down the face to the lips.

Bleach—See Cheese Defects, (Color-Cheddar.)

Bleaching Milk for Cheesemaking—See Cheese.

Bleaching or Chlorine Powders—Name generally given to such products as calcium hypochlorite and sodium hypochlorite, the latter of a 10% chlorine strength, used in dairying for cleaning and disinfectant purposes.

Bleat—The cry of sheep, goat or calf.

Bleed—To withdraw blood from the body.

Bleeding—See Ice Cream Defects.

Blend—To mix different kinds of a product as milk or grades of milk to standardize the product—blended milk or blended feeds.

Blended Milk—See Milk.

Blended Price of Milk—A price paid by dealers for milk sold under the classified price plan. It is arrived at by finding the per cent of milk sold in each class at the specified price per hundred weight for each class and then finding the average of these amounts.

Example—A dealer sells:
 70% Class I @ \$2.40 per 100 wt.—\$168.00
 10% Class II @ 1.75 per 100 wt.— 17.50
 5% Class III @ 1.65 per 100 wt.— 8.25
 15% Class IV @ 1.10 per 100 wt.— 16.50

100% 100 | \$210.25
 Blended Price \$2.10
 paid to the producer for all his milk.

Blending, (in process cheese)—See Cheese

Blcu Cheese—See Cheese

Blind Cheese—See Cheese Defects (Swiss)

Blind Gut—The caecum the blind pouch or sac in which the large intestine begins and into which the small intestine opens from one side called the appendix in man but in herbivorous mammals it is often as large as the rest of the large intestine

Blind Staggers—See Diseases in Cattle

Bloat—See Diseases in Cattle

Bloats—See Dried & Evaporated Milk Defects

Bloats or Blower, (Swell heads)—See Cheese Defects (Swiss) also Condensed and Evaporated Milk Defects

Block—The name of a unit employed by the cooperative bull associations in the U.S. These associations were organized in so-called blocks. Each block contained from one to ten dairymen and there were from three to ten blocks in one association. The average association had about five blocks and one sire was assigned to each block. To prevent inbreeding each sire was moved to the next block every two years. These have largely been supplanted by artificial breeding cooperatives.

A grooved pulley encased in a frame or shell which is provided with a hook eye or strap by which it may be attached to an object used to change the direction of motion.

A stocky well built animal

Block Milk—See Milk—Condensed & Evaporated

Block Swiss Cheese—See Cheese

Blocky—A deep wide low-set and compact animal especially applied to meat producing animals and draft horses

Blood—The red fluid that circulates through the heart arteries capillaries and veins it carries oxygen and nutriment to the tissues and removes from them carbon dioxide and other waste products. The arterial blood is that which has been purified in the lungs is of a bright red color and is found in the pulmonary veins left side of the heart and the arteries the venous blood is that charged with waste material it is of a dark red color and circulates in the veins right side of the heart and

pulmonary artery. The blood is a fluid plasma in which are numerous cells the erythrocytes and leucocytes the platelets and the hemoconia.

Blood, (Dried)—A by product of the packing house trade which contains 8 to 12% nitrogen and is used as an organic fertilizer. Its use as a fertilizer is now more or less obsolete because much more important uses are found for blood material.

Blood Flour, Blood Meal—See Feeds & Feeding

Blooded—Entirely or largely of pure blood of approved breed of the best stock.

Term is incorrectly but quite generally used meaning purebred.

Bloodline—In animals a sequence of direct ancestors in a pedigree. Often transmitting a distinctive trait of character.

Bloody Milk—See Milk & Cream Defects

Bloom, (in cheese)—See Cheese

Bloom Gelometer—An instrument for grading gelatin on the basis of gel strength. It consists of a cylindrical plunger with a flat surface 1 sq cm in diameter in contact with the gel. A stream of lead shot flows into the cylinder. When the gel has undergone a surface deformation of 4 mm the stream of shot automatically is shut off. The weight in grams of the cylinder and shot represents the strength of the gel.

See also Bloom Test

Bloom Test—See Dairy Tests

Blow Holes—See Cheese Defects (Swiss)

Blow Torch—A small automatic blast lamp or torch used in plumbing etc.

Blower—A device for producing a current of air as a rotary fan. Used in separating chaff from the grain and for drying grain hay and to facilitate movement of air in storage rooms to be heated, dried or cooled.

Blow-off Valve—A valve usually connected to the lowest point of a steam boiler for the purpose of emptying it or to blow out the mud and sediment which may collect at the lowest point in the boiler.

Blown Evaporated Milk—See Defects Dried & Evaporated Milks
See Bloats

Blue Book—The Advanced Register Year Book of the Holstein-Friesian Association of America, which contains information on the production records of cows, and sires whose daughters have been admitted to Advanced Registry. Not to be confused with the Red Book or Herd Improvement Register, published by this association.

Blue Cheese Flavor—See Cheese.

Blue Cheese Slime—See Cheese Defects, (Finish & Appearance).

Blue Cheese, (Standards), Blue Coating—See Cheese.

Blue Color—See Cheese Defects, (Color-Cheddar).

Bluegrass—See Feeds & Feeding.

Blue Milk—See Milk & Cream Defects.

Blue Mold Cheese, Blueing Process, Blue-veined Cheese—See Cheese.

Board Foot—A unit of lumber measured one foot long, one foot wide and one inch thick or its equivalent.

Board Measure—A measure used to express the contents in board feet of lumber or the estimated contents in board feet of logs and standing timber.

Board of Health Lactometer—See New York Board of Health Lactometer.

Board Rule—A measuring stick provided with scales for finding without calculation the number of board feet in a board, joist, or the like.

Bohtail—An animal with a short tail; as a horse or dog. Generally an animal whose tail has been cut or docked.

Bob Veal—Veal too immature to be used for food. The sale of such veal is generally prohibited by statutes limiting the age of veal that may be sold to not less than four weeks.

Body—In physics, the properties of a mass as regards its consistency, strength or firmness. In ice cream, resistance to melting is also included.

The whole organized substance of an animal or plant, whether alive or dead.

The box of a vehicle or main part of a tool; the working part of an agricultural implement.

Body Cells—Leucocytes and epithelial cells derived from the tissues of the udder of the cow and normally present in milk.

Body Cheese—See Cheese.

Bog—Wet spongy ground, occurring in a depression. The conditions of improper drainage permit the accumulation of decaying and partially decayed vegetable matter.

Bog-Butter—Butter buried in peat bogs in Ireland for the purpose of storing and of ripening the flavor. This old Irish custom, not now in practice, dates back to the 15th and 16th centuries. Reports indicate that the butter was either packed in firkins or wrapped in skins before it was buried in the peat bogs.

Boil—A hard, painful, inflamed tumor, which on being opened discharges pus mixed with blood, and discloses a small fibrous mass of dead tissue, called the core.

Boiler Feed Water—The water used in the steam boiler. Water for this use should contain not over 10 grains of mineral (solids) per gallon, and acids present should be neutralized in order to prevent corrosion of boiler metal by acid, and by deposits of scale or sludge in the boiler. Scale in the boiler also hinders efficiency of fuel.

See Soft Water. See Hard Water.

Boiler Horsepower—A unit or measure of the rate of conversion of water into steam by a boiler. The value given to one unit of boiler horsepower is the conversion of 34.5 lb. of water per hour from water at a temperature of 212° F. into steam at the same temperature.

Boiler Room—In a dairy plant, the boiler room is a special room which houses the boilers that provide the necessary steam and heat to carry on plant operations.

Boiler Setting—The general arrangement of the boiler together with the foundation and support, in which are included the fire-box, ash pit, combustion chamber, bridge wall, supporting wall, front, clean-out, fire-doors, etc.

Boiling—The point at which a liquid is converted into vapor.

Boiling Point, (Milk)—The temperature at which milk boils. According to Dr. Hunziker this temperature is 212.3° F.

Boiling Points—Alcohol, 78° C; Ammonia, 33° C; Ether, 35° C; Mercury, 357° C; Water, 100° C, 212° F.

Boiling Test—See Dairy Tests

Bologna Bull—In livestock marketing, a bull of medium to common grade

Bolt—A pin or rod of iron or other material to hold or fasten something in place, usually having a head at one end and a screw thread cut on the other

Bolus—Mass of food, moistened by ruminants with saliva, in suitable form to be swallowed. Masses of this undigested food pass into the forward part of the paunch through the esophageal groove. They are carried to the rear of the paunch by muscular movements gradually absorbing moisture, until they sink and mix with the other contents

Bondon Cheese, Bondost—See Cheese

Bone—Any distinct piece of the osseous framework or skeleton of the body

Bone Black, (Spent)—See Feeds & Feeding

Bone Meal, (Raw)—The ground animal bone used as a fertilizer, composed essentially of calcium phosphate and containing approximately 20-25% available phosphoric acid.

Made from the poorer quality bone—this product often has a strong odor and dark color. Bones are cooked in open kettles—protein is not completely removed—thus percentage of calcium and phosphorus is lower than in steamed bone meal

Bone Meal, (Steamed)—See Feeds & Feeding

Bone Phosphate—Calcium phosphate, $\text{Ca}_3(\text{PO}_4)_2$, the chief mineral constituent of bone

Bonnet—The second stomach of a ruminant. See Reticulum

Boom—A chain rope or other device used to fasten a load of hay, logs, etc., to keep the parts in place

A pole or beam which supplies the leverage for securing a load

Boom Hoist—A hoist having a boom or spar projecting from the mast to guide and support the load

Booster Pump—A pump used to increase pressure of fluids, as a booster pump on a truck.

Borax—Sodium tetraborate ($\text{Na}_2\text{B}_4\text{O}_7$) A white crystalline salt, slightly alkaline to taste. As a constituent in washing powder it has certain advantages of emulsification and disinfecting powers.

Borax Mixture—A fungicide made up of copper sulfate (blue vitriol) lime and water. A common mixture is four pounds of blue vitriol, four pounds of lime, fifty gallons of water

Boeden Flow Meter—A device for determining the viscosity of cream by measurement of the time required for $\frac{1}{2}$ pt of cream to flow through a standard orifice. Temperature must be controlled within 0.5°F to obtain reproducible results

Borelli—See Cheese

Boring Block—A slotted block for holding work to be bored

Boring Head—The cutting end of a boring tool, as a diamond cutter

Boring Tool—An internal turning tool, for use in boring a smooth-edged hole or finishing a hole to specified size. Usually has a single cutting edge in contrast to a drill which is ordinarily double-edged

Boron—One of the essential minor elements in plant nutrition, the lack of which may cause serious deficiency diseases, such as yellowing in alfalfa, cork in apples and cracked stem in celery

Bos—A genus of ruminant quadrupeds including the wild and domestic cattle, distinguished by a stout body and a hollow curved horn standing out laterally from the skull

Bospro, (Bordens)—Dry feed supplement for dairy and beef animals

Boss, (Machinery)—The enlarged part of a shaft on which a wheel is keyed, or at the end where it is coupled to another

Botany—That branch of the wider science of biology which deals with plant life in all its phases. There are many sub-divisions of Botany such as Agriculture

Linnaeus, Swedish scientist, generally is recognized as the father of modern botany

Bottle Cap—A covering for the top of a milk bottle—generally a flat circular disc of waxed Manila board. Although this is the common type of bottle cap, more elaborate caps designed to offer greater protection to the pouring lip of the bottle are also on

the market. Among these are the Standard Cap which covers the whole mouth of the bottle; the Seal Cap which covers a part of the lip of the bottle; the Aluminum Foil Cap which is formed on the mouth and lip of the bottle; the Vacuum Seal Cap which requires a rubber gasket and special bottle; and the Crown Cap commonly seen on gingerale bottles, which is a metal cap with cork lining, pressed and crimped on bottles specially designed to receive them.

Bottle Capper, (In the dairy)—A machine for capping milk bottles automatically after they are filled with milk. Usually the capper is attached to the bottle filler. However, a small number of machines which can be operated by hand are available.

Bottle Exchange—A medium through which dealers cooperate with one another in getting back stray bottles. This organization, through inspection service, forces all dealers to use their own bottles instead of using bottles belonging to other dealers. It also forces slacker dealers to purchase sufficient bottles to maintain a bottle supply to carry on their milk business in just competition with other dealers. Usually a truck calls once a month at the various plants returning bottles and picking up bottles belonging to other dairies. There is a definite charge per bottle returned and a smaller amount is paid for bottles given to the Exchange which belong to other dairies in the Exchange.

Bottle Filler, (In the dairy)—A machine for filling milk bottles. Most fillers also have a capping device attached.

Rotary fillers and cappers are most common. They consist of a circular tank with automatic valves. Each bottle is automatically raised as it comes under the valve and the milk flows into it. After the bottle has travelled the full revolution of the tank it is automatically lowered, the valve closing at the same time. The bottles then pass on to the capper where they are automatically capped.

Recently a new rotary filler was placed on the market, the bottles being filled on the principle of a low vacuum.

Bottle Fillers for (Paper) Bottles—There are many types of paper bottles on the market and more are in process. The standard filler such as that used for glass bottles is used on one type of prefabricated paper bottle. This type also uses a standard cap such as is used for glass bottle fillers.

An extensively used type of paper bottle filler takes the pre-cut, flat, cardboard

bottle usually shipped in knocked-down condition. The machine forms them into shape, fills them and paraffin coats and seals them all in an automatic, continuous operation.

Another type generally known as paper, prefabricated bottle is usually filled on a special filling machine which opens the bottle cap, fills the bottle with a measured amount of milk and seals the cap.

Paper containers are also made right in the plant, from wet pulp.

Bottle Washers—See: Brush type bottle washers; Pressure type bottle washers; Soaker type bottle washers.

Bottles, Milk—A very large percentage of milk is still marketed in glass bottles. Most of these bottles are in the conventional round shape but a large proportion are square shaped which pack more economically in refrigerators and are therefore more popular with the housewife.

These bottles for milk and cream vary from ½ pint, pint, quart, half-gallon and gallon size. Increasing amounts of milk are now put up in the larger containers.

Bottling Machine—See Bottle Filler.

Botulism—A type of food poisoning formerly quite prevalent, caused by *Clostridium botulinum*, which under anaerobic conditions produces a toxin (botulin) in cooked foods such as home canned peas, beans, meats, etc., which have not been processed at proper temperatures. The toxin (poison) is readily destroyed by heating to 212° F. for 5 to 10 minutes. With the advent of commercial canning and freezing this type of poisoning has become rare.

Boudanne Cheese—See Cheese.

Bound Water in Cheese—See Cheese.

Bourgain—See Cheese.

Bourquin-Sherman Unit—A vitamin G unit representing that amount of vitamin G which, when fed daily to young rats, will give an average weight gain of 3 grams per week during 8 weeks, in addition to any appreciable gain in the group of control test animals on the vitamin G-free ration.

Bovine—Pertaining to cattle, the genus *Bos*; relating to, or resembling the cow or ox; also other animals belonging to the cattle group, as sheep, goats and some antelopes.

Bovine Infectious Abortion—See Diseases in Cattle, (Bang's Disease).

Bovine Serum Albumin—An albumin present in bovine blood. It is also present in cows' milk to the extent of about 0.3 grams per liter.

Bowels—The intestines of man and animals.

Bow-legged, (In cows)—A deformity in which the legs are too far apart at the hock and are bent inward laterally below the knees.

Bowl, (Drinking)—A hollowed basin from which animals may drink, especially in a barn as in a stanchion; most types are self-operative.

Box Cheese—See Cheese.

Box Churn—See Butter.

Box Nut—A nut with a blind hole. Also cap nut.

Box Wrench—A wrench with a socket head to fit over a bolt or nut.

B Q C—A term used to designate Dibromo-quinonechlorimide, the indicator used to form a blue color with phenol in the phosphatase test, a test to indicate whether or not milk has been pasteurized.

Boxes, Butter—See Butter.

Boxes, Cheese—See Cheese.

Bra Cheese—See Cheese.

Brace Root—A top or arial root of corn or other grass plants.

Brad Awl—A straight awl with a chisel edge, used to make holes for screws, etc.

Brahman Cattle, (Brahma or Zebu)—These names are attached loosely to more than thirty breeds of cattle native to India from which original shipments were made to the U. S. Quite likely the Brahman cattle of India were domesticated long before the European breeds now so largely used in the U. S. Brahman cattle are characterized by a very prominent hump over the shoulders, an abundance of loose pendulous skin under the throat and along the dewlap. They have a narrow body, large drooping ears, and an upstanding appearance somewhat like a buffalo. Brahman cattle due to their hump and loose pendulous skin seem to have a natural cooling apparatus which particularly adapts them to hot climates. Crosses with native beef breeds are popular and are greatly increasing in numbers in Florida, Texas, and other Gulf Coast regions of southern U. S. They stand heat exceptionally well and apparently are not bothered seriously by mosquito ticks and flies. They also seem to be resistant to

Texas fever and they are sufficiently muscular so that they are great rustlers for feed in regions where vegetation is scarce.

Among the most important breeds and crossbreeds are the widely known red dish brown or cherry red Santa Gertrudis breed, the result of crossbreeding Brahman and Shorthorn; Brangus, black in color, the result of crossing Brahman and Angus; Charbray, cream or beige color, a cross of the French bred Charolaise and Brahman; Beefmaster, mostly brown, developed from Brahman, Hereford and Shorthorn crosses. Headquarters: American Brahman Breeders Association, Houston 2, Texas. See Santa Gertrudis and Zebu.

Brain—In vertebrate animals, the large mass of nerve tissue which is inclosed in the skull and in which the anterior end of the spinal cord terminates. For further description see books on Anatomy or an Encyclopedia.

Brake or Breaker—See Cheese.

Brake Horsepower—Measured horsepower output of an engine, motor or power unit, the measurement being made through use of some form of electrical or mechanical brake.

Bran—See Feeds & Feeding.

Bran Disease—See Diseases in Cattle.

Brand—An identification mark burned upon an animal or other possession to designate ownership.

Brand Cheese—See Cheese.

Branding—See Cheese.

Brand Iron—An iron used to make a brand.

Branza de Braila—See Cheese.

Breadlac, (Borden's)—Spray process nonfat dry milk solids for bakers, confectioners and prepared flour manufacturers.

Break-a-way—A term used to describe a wild rush of cattle, sheep or horses, a stampede.

Also: one animal that breaks away from a herd.

Breaker—A plow with a long low moldboard for turning the furrow slice of virgin land slowly and with a minimum of resistance. Also called prairie breaker.

Breakfast Cheese—See Cheese.

Breaking—The process of training an animal to obedience, usually to work or to milking or to proper place in barn.

Breast—The fore part of the body; the breastbone with its attached muscles.

Also, in a plow, the front part of the moldboard which turns the furrow.

Breast Feeding—Process of nursing the infant from the breast.

The advantages at least in the early stages seem to be that the mother's first milk carries antibodies which in turn give certain immunity to the child. There should be less danger of disease being transmitted to the child and unless cows' milk has been modified, it should be better balanced chemically for the young infant. See Handbook section, P. 119.

Breed—A breed is a group of animals having a common origin and possessing certain distinguishing characters not common to other animals of the same species, these characters being so firmly fixed as to be uniformly transmitted from parents to offspring.

To produce off-spring by hatching or gestation. To propagate as by artificial pollination or artificial insemination.

Breed Associations—Associations of the breeders of the various breeds of livestock. Each breed association has its own permanent organization and headquarters with an executive secretary and staff to carry on the work of registering the purebred animals of that particular breed, and of promoting the breed.

Among the leading dairy breed associations in the United States are the following: American Guernsey Cattle Club, Peterboro, New Hampshire; American Jersey Cattle Club, Columbus, Ohio; Ayrshire Breeders' Association, Brandon, Vermont; Holstein-Friesian Association, Brattleboro, Vermont; Brown Swiss Cattle Breeder's Association, Beloit, Wisconsin; Milking Shorthorn Society, Springfield 4, Missouri.

Breed Character—A combination of masculinity or femininity with ideal breed type features.

Breed Journals—Journals which are published to promote the breeds of livestock. Those for the dairy breeds are as follows: Ayrshire Digest, Brandon, Vermont; Brown Swiss Bulletin, Beloit, Wisconsin; Guernsey Breeders Journal, Peterborough, New Hampshire; Holstein-Friesian World, Lacona, New York; Jersey Journal, Columbus, Ohio; Milking Shorthorn Journal, Springfield, Missouri. Other breeds of livestock have journals promoting their breeds.

Breed Method—See Microscopic count of bacteria.

Breed Registry Associations—Same as Breed Associations.

Breed Type—That particular form or characteristic of a breed which distinguishes it from other breeds. These may be such characteristics as color, shape or form.

Breeder—A person who propagates plants or animals, more specifically, one who is attempting to improve animals or plants.

An animal or plant used for propagation.

Breeder's Young Herd—A group classification of dairy cattle for the show ring. It consists of one bull under 2 years, 2 heifers under 1 year, 2 heifers one year and under 2 years—females to be bred by exhibitor.

Breeding—The skillful practice of improving animals and plants by proper mating.

See "Essentials of Dairy Cattle Breeding" in Handbook P. 26.

Breeding Crate—A specially constructed stall-like crate for breeding of cattle.

Breeding Pen—A breeding pen is a stall or pen in which cows can be tied when being bred.

Breeding Plant—Improvement of plants by cross-fertilization, self-fertilization and selection.

Breeding Program—A plan adopted by a cattle breeder for the purpose of securing a definite type of herd or group of animals which he is seeking, whether it be for beef, milk production, or both. The breeder keeps records of performance of bulls and cows and endeavors to mate the outstanding animals over a period of time.

Breeding Rack—A place where a female animal may be stood for copulation; usually provided with a device whereby the male may support part of his own weight; used, especially, with young females and mature males; also, a safety device for the breeder.

Breeding Records—A record of the breeding of the animals in a herd. It should include

1. Dates the cow comes in heat.
2. Service dates.
3. Sire used.
4. Date when cow is due.
5. Date the cow calves.
6. The health history of the cow after calving, such as retained placenta, metritis, etc.

Such records are very important when the herd is being bred artificially.

Breeding Stall—A stall in which animals are placed for copulation or for collection of semen

Breeds of Beef Cattle—The breeds of cattle that have been developed primarily for meat production. Five main beef breeds are found in the United States namely the Shorthorn Hereford Aberdeen Angus, Gal loway and Polled Durham

In recent years Brahman cattle have become quite popular particularly in the Southern States

Breeds of Dairy Cattle—The breeds of cattle that have been developed primarily for milk and butterfat production. There are five main dairy breeds in the United States namely, Ayrshire Brown Swiss Guernsey, Holstein Friesian and Jersey. Besides these there are several minor dairy breeds found in limited numbers in the United States. They include the Dutch Belted the French Canadian the Kerry the Dexter the Red Dane and Danish Black & White

Breeds of Dual-purpose Cattle—The breeds of cattle that have been developed for both meat and milk and fat production. They include such breeds as the Milking Shorthorn the Red Polls and the Devon

Bremil—Powdered infant food completely modified milk in which nutritionally essential elements have been adjusted or altered in order to produce a product that supplies the nutritional requirements of infants deprived of human milk

Brewers' Dried Grains, Brewers' Grains, Brewers' Wet Grains—See Feeds & Feeding

Brick, (Standards, Flats), Brickbat, Brice—See Cheese

Brindle—Spotted or streaked generally said of an animal having dark streaks or spots on a gray or tawny background color

Brine, (in dairying)—A mixture of salt and water with a low freezing point used for refrigeration. On account of its relatively low freezing point calcium chloride is the salt most commonly used in the brines that are used for refrigeration

Brine Alarm System—A tell-tale system of brine control which avoids heavy loss and excessive dilution of the brine in a tank. A brine level alarm consists of a float with rod and rod guide and an automatic electric switch and bell which signal when the brine level drops below or rises above the normal range. The alarm is located at the

proper level of the brine in the tank, and the contacts on the switch may be made so that the bell rings when the brine level is about $1\frac{1}{2}$ inches above normal or about $1\frac{1}{2}$ inches below normal

Brine Cartridge System—A sealed metal container holding a brine solution which is frozen and used as a source of refrigeration for dairy products generally ice cream. Cartridges vary in size from one a few inches square to one about the height of a five gallon can

Brine Cloth, (in cheesemaking)—See Cheese

Brine Disks—See Cartridges

Brine, (in cheesemaking)—See Cheese

Brine Method, (Refrigeration)—A system of mechanical refrigeration in which the coils for expansion of the refrigerant are placed in a tank of brine. The brine is circulated from this tank through coils located in the refrigerating room. This method has the advantage that the compressor can be smaller run for a longer period of time thereby storing up cold to be used when needed. However the direct expansion system although requiring a larger compressor eliminates the intermediate cooling tank and is more economical to operate because of higher back pressures generally used

Brine Salting—See Cheese

Brine Tank—Tank or vat containing brine

Brine Tests for Milk—See Dairy Tests

Brining—See Cheese

Brinsen, (Lipiau)—See Cheese

Briny Flavor—See Butter Defects

Brinole—See Cheese

Brusket—The lower part of the chest in front of and between the forelegs of quadrupeds sometimes extending back some distance behind the forelegs

British Thermal Unit, (Btu)—The quantity of heat required to raise the temperature of one pound of water one Fahrenheit degree. Equal to about 252 gram calories. 2546 Btu theoretically produces one horse power for one hour. A therm (gas) equals 100,000 Btu

See Therm

Btu—Abbreviation for British Thermal Unit

Brittle Texture—See Butter Defects and Cheese Defects.

Broad Base Terrace—In farm tillage, a low wide terrace used on gentle slopes.

Broad Breeding—Breeding from a large group, but usually without crossing distinctly unlike strains; opposite of narrow breeding.

Broadcast, (in farm crop seeding)—Scattering seeds in all directions by hand or machine; to spread widely; to diffuse.

Broken Mouth, (in livestock)—The mouth of an old animal that has some teeth missing, usually the incisors.

Broker—One who executes buying or selling orders for another person, usually on commission.

Brom Cresol Color Test—See Dairy Tests.

Brom Thymol Blue Test—A simple test for the detection of mastitis. To 3 cc. of milk in a small test tube add 2 drops of a concentrated alcohol solution of brom thymol blue. Mix thoroughly and compare with a color standard. Normal milk should give a yellowish-green color. A blue color denotes an udder infected with mastitis. The alkalinity of the milk is responsible for the color change.

See Diseases of Cattle—Mastitis.

Bromine Value—See Hubl-Wijfs Value.

Brood, (in livestock)—The keeping for breeding purposes, as a brood mare, brood sow; also having or producing young.

Broom Corn Millet—See Feeds & Feeding.

Brown, Red or Pink Spots—See Cheese Defects (Swiss).

Brown Sugar & Maple Sugar, (as used in Ice Cream)—See Ice Cream.

Brown Swiss—A breed of dairy cattle originating in Switzerland and often classed as a dual-purpose breed since the animals are used not only for milk but for beef and draft purposes. It is a slow-maturing breed. Mature cows average about 1300 lb. while bulls average 1800-1900 lb. Their color varies from a dark to a light brown approaching gray. Under farm conditions this breed will produce a good average yield of milk testing about 4% fat. Details regarding this breed can be secured from the Brown Swiss Cattle Breeders' Association, Beloit, Wisconsin. See Handbook.

Brown Swiss Cattle Breeders' Association of America, Inc.—See Brown Swiss.

Brownian Movement—A continuous agitation of small particles, such as bacteria, in colloidal solutions caused by constant bombardment of invisible molecules in the surrounding medium.

This movement, named for Robert Brown, English botanist, is different from, and should not be confused with the motility of bacteria.

Browning—See Dried & Evaporated Milk Defects.

Browse—The tender portion (leaves, buds, twigs and shoots) of woody plants consumed by animals; to feed upon or nibble as cattle browse in the pasture.

Also: to read here and there in a collection of books or other reading material.

Brucella—A genus of small, gram negative, short bacilli or coccobacillus, usually non-motile. Growth on ordinary media is scanty if present. Carbohydrates are not fermented. Reaction in culture media is alkaline. They are strict parasites, pathogenic (disease producing) for animals and man. The three species are as follows:

1. *Brucella melitensis*—a parasite of goats causing Malta fever (clinically the same as undulant fever in man). There are no consistent morbid symptoms, and if man had not been infected, the disease in goats might never have been suspected. Abortion may take place in 50 to 90% of the animals when a flock is first infected; however, *Br. melitensis* may be present in milk, urine, blood, and tissue. The organism is an aerobe and produces NH_3 from nitrate broth to a greater extent than the other species. There is a very slight production of H_2S .
2. *Brucella abortus*. This organism is the agent of infectious abortion in cattle. It grows best under an increased CO_2 tension of about 10% over that of the primary air until it becomes adapted to aerobic conditions.
3. *Brucella suis*. This organism causes a splenic lymphadenitis in hogs. The disease is not essentially an abortion disease. The organism is an aerobe producing much H_2S .

While differing but little in cultural characteristics, morphology, and staining, other methods may be used. The *melitensis* species may be separated from the other two by the agglutinin absorption test, infection being

proved to be of the *melitensis* type if *melitensis* antigen completely removes the agglutinins in the serum. If completely removed by the *abortus* antigen the infection is of the *abortus* or *suis* type. On liver agar slants more H_2S is produced by *Br suis* than by *Br abortus*. In determination by means of bacteriostatic action of dyes it will be found where thiamin and basic fuchsin have been used that streak plates of basic fuchsin allow low growth of *Br abortus* but not *Br suis*, while on plates of thiamin agar the reverse holds true.

Some of the Designations by which
Brucella Organisms have been
and are still known
Caprine (goats)

- 1 *Micrococcus melitensis*
- 2 *Bacillus melitensis*
- 3 *Pacterium melitensis*
- 4 *Alcaligenes melitensis*
- 5 *Brucella melitensis*

Bovine (cattle)

- 1 *Bacillus abortus* (Bang)
- 2 *Corynebacterium abortus endemici*
- 3 *Bacterium abortus*
- 4 *Alcaligenes abortus*
- 5 *Brucella melitensis* var *abortus bovine* type
- 6 *Brucella abortus*

Porcine (swine)

- 1 *Brucella melitensis* var *abortus porcine* type
- 2 *Brucella suis*

Brucellosis, (Brucellosis Germ, Type #2)—
See Diseases of Cattle

Brush Type Bottle Washers—A type of milk bottle washer used in small plants. Dirty bottles are allowed to soak in a tank of washing solution and are then placed upon a revolving brush by the operator. After brushing a case of bottles the case with bottles inverted, is placed in a chamber where it is *steamed with hot water and* steamed.

Buck-kneed—Knees bent forward when standing.

Also called buckling over.

Buckwheat, Buckwheat Bran, Buckwheat Feed, Buckwheat Middlings—See Feeds & Feeding.

Budding—A form of reproduction in yeast where buds are produced from the parent cell and are severed forming daughter cells.

"Budding"—A method to prolong the keeping quality of milk and to render milk safe by means other than heat. This method was introduced by Prof. Budde of Copenhagen in 1903. It consists of adding 12 cc. of hydrogen peroxide to 1 quart of milk and keeping the mixture at 52° C. for several hours. The majority of bacteria are destroyed but a small excess of hydrogen peroxide imparts a disagreeable bitter taste to the milk. This can be overcome by adding a catalase. The method is too complicated to be of practical value.

Buffalo Clover, Buffalo Grass—See Feeds & Feeding.

Buffalo Milk—See Milk Composition of.

Buffer—A substance which resists change in pH when acids or alkalis are added to it. Buffers are salts of weak acids or weak bases. Buffer salts in milk are phosphates, citrates, bicarbonates and proteins.

Approximate Buffer Values		pH
1	Primary Potassium Citrate	5.7
2	Secondary Sodium Citrate	5.0
3	Boric Acid—Sodium hydroxide	9.2
4	Sodium bicarbonate—sodium carbonate	10.2
5	Disodium phosphate—sodium hydroxide	11.5
6	Potassium acid phosphate—disodium phosphate	6.8
7	Potassium acid phosphate—sodium hydroxide	6.8

Bufflovak Drum Drier, Bufflovak Rapid Circulation Evaporator—See Milk Processing and Processing Equipment.

Buildings, (Dairy)—See Dairy Farm Structures in Handbook P 210.

Bulb, (in plants)—An underground food storage organ of some plants formed of the thickened bases of overlapping leaves.

Bulgarian Milk—See Milk Fermented.

Bulk—The property of possessing much size or volume in relation to weight. A term used in connection with feeding stuffs as handled in bulk.

"Bulk line" Method—A method sometimes used by economists in arriving at the cost of milk production. In using this method an arbitrary line is drawn on the cost tables below which the greater quantity of the milk is produced generally 80-90% of the supply. The cost of production at the line is used in determining the price paid the producer for his milk.

Bulk Package—See Ice Cream.

Bulk Starters—See Butter.

Bulk Tank Collection—This method of collecting milk is economical, saves considerable labor and improves the quality of milk. These tanks are refrigerated and so calibrated as to make measuring satisfactory.

In large farms this system is proving popular and becoming rapidly accepted as most satisfactory. Most dairy equipment people now make these tanks.

Bull—The male of any species of cattle of the genus *Bos*.

Bull Association—A cooperative organization was designed for securing the service of better bulls among dairy farmers. The association was made up of a number of cooperative blocks, one in each neighborhood. These blocks were linked together in the association to form a circuit, bulls being rotated around the circuit from one block to another. These associations have largely been supplanted by artificial-breeding associations.

Bull Index—A measure of the inheritance of milk and butterfat production which a bull tends to transmit to his daughters. It is used as an index for future breeding.

Bullock—An English term for a finished fat steer; castrated bull calf.

Bull Market—A stock market term applied to a stock market commodity or security prices that trend upward.

Bull Ring, (Bull Holder)—A ring for fastening or leading a bull by the nose.

Bulls—A stock market term for speculators who are working to raise prices; opposite of "bears."

Bull Staff—A staff used to fasten in the ring of the bull by which the bull can be led with relative safety.

Bull Stag—A bull castrated after the secondary sex characters had developed to such a point as to give it the appearance of a mature male.

Bull Stud—An establishment fostered by federated artificial insemination organizations where bulls are kept for the production of semen to be used in the artificial breeding program.

A place where a group of bulls are maintained for breeding purposes. The great

majority of the bull studs are owned cooperatively by dairy farmers and the breeding is done artificially.

Bundle Corn—See Feeds & Feeding.

Bar Clover—See Feeds & Feeding.

Bureau of Animal Industry, (BAI)—Division of the U. S. Department of Agriculture established to deal with animal disease control, and livestock improvement. In so far as milk industry is concerned the bureau has dealt especially in the eradication of tuberculosis and Bang's Disease among cattle. Both diseases are milk borne and may be transmitted to milk consumers in unpasteurized milk. Bang's disease produces undulant fever in humans.

Bureau of Dairy Industry—See Dairy Husbandry Research Branch.

Butke Test, (Gelatin)—See Dairy Tests.

Burned Lime—Lime prepared by heating limestone and driving off the carbon dioxide. Also called quicklime, caustic lime, lump lime, and unslaked lime. CaO , MgO , or a mixture of CaO , MgO .

Burnt Flavor—See Milk & Cream Defects.

Burri Method—See Dairy Tests.

Burton-Ail—See Diseases in Cattle.

Bushel—A dry measure containing four pecks or thirty-two quarts. The common measure for farm produce such as grains, corn, apples, potatoes, etc.

✓ B U T T E R

"Butter shall be understood to mean the food product usually known as butter, and which is made exclusively from milk or cream, or both, with or without common salt, and with or without additional coloring matter, and containing not less than 80% by weight of milk fat, all tolerances having been allowed for."

Butter—U. S. Grades as established by USDA-Agric. Marketing Service, April 1934 and scores:

1. U. S. Grade A⁺ or U. S. 93 Score
2. U. S. Grade A or U. S. 92 Score
3. U. S. Grade B or U. S. 90 Score
4. U. S. Grade C or U. S. 89 Score
5. U. S. Cooking Grade
6. No grade.

✓ **Butter Accumulator**, (A combination separator and butter churn)—This machine originated about 1890 and was manufactured at Bainbridge N Y. Like a separator it received the milk and separated it from the cream. Then the cream dropped into another compartment where the separation continued until butter and buttermilk appeared. The so-called sweet butter and the buttermilk were then delivered from the machine. A temperature of 65° F was desirable.

Butter, Adulterated—Butter the composition of which has been altered by the addition of foreign fats such as lard tallow, oleomargarine hydrogenated vegetable and animal fats etc.

Butter containing less than 80% butter fat

✓ **Butter, (American Creamery)**—Composition of

	Water %	Fat %	Salt %	Curd %
Probable range	14-17	80-80.5	1.5-3.0	3-7
Good composition	17.5	80.2	2.0	5

✓ **Butter Boxes**—Wooden boxes holding from 50 to 56 lb of butter. These boxes are used for shipment of butter both to foreign countries and to domestic markets. They are paraffined and carefully lined with parchment paper in the same manner as tubs.

✓ **Butter Color**—A material used in artificially coloring butter when the color naturally present is insufficient to satisfy the trade. The coloring principle in butter colors is of either vegetable or mineral origin. The former is derived from the seed pod of the annatto plant while the latter is derived from harmless oil-soluble coal tar dyes. The medium carrying the coloring principle is a neutral oil such as corn oil or cotton seed oil.

Only two coal tar colors are used for tinting butter. They are FDC #3 (1-Phenylazo-2-naphthylamine) and FDC #1 (1-O-Tolylazo-2-naphthylamine) both certified as harmless and suitable for use as food coloring by the Federal Food and Drug Administration.

See Annatto

✓ **Butter Churn**—A vessel in which cream is agitated in order to facilitate the bringing together and adhering to each other of the fat globules incident to the formation of butter. There are many different types of small churns on the market chief among

which are the barrel box, dasher, and swing types.

The larger churns found in creameries and factories are of the drum type, in which the agitation is usually brought about by the motion of the churn itself. The diameter of these churns varies from three to ten feet and in most cases the butter worker is a combined part of the churn. Later models are built with baffle boards that tend to fold the butter as the churn turns over. Stuffing boxes are eliminated and chance for contamination minimized. Cubical metal churns have become popular in recent years. The latest development in buttermaking is the Continuous Process—See Buttermaking, Continuous Process.

✓ **Barrel Churn**—A rotating or revolving barrel adapted to churning butter.

✓ **Box Churn**—A box shaped wooden churn for churning butter. Agitation of the cream is brought about by motion of the churn. The box churn has the disadvantage of having too many corners in which the cream will collect resulting in both a fat loss and difficulty in cleaning.

✓ **Dash Churn**—An upright butter churn in which agitation is provided by a moving wooden paddle. There are a number of kinds and sizes of dash churns ranging from a small glass jar with a wooden paddle to the large round upright churns with large wooden paddles. Dash churns are not used to any extent in the dairy industry today.

✓ **Churn and Worker (Combined)**—A type of butter churn in which the butter worker is a part of the churn, the butter remaining in the churn during the working process.

✓ **Swing Churn**—A small wooden container suspended horizontally from a beam and pushed back and forth by hand. The concussion is not great, therefore churning by this method was slow and has been superseded by other methods. This type of churn was originally used in Asia Minor. Also called Swinging Churn.

✓ **Churning Process**—Churning of cream with the subsequent formation of butter, consists of agitation at suitable temperatures until the butterfat globules adhere, forming larger and larger butter masses until a relatively complete separation of fat and serum occurs. Commercially the churning process itself should take from 35 to 40 minutes. See Buttermaking, Continuous Process. See also Handbook Section P 158 147.

Churn, (Cleaning of)—The churn, like other dairy equipment, must be very carefully cleaned as the churn, unless carefully handled, is apt to be the cause of considerable bacterial yeast and mold growths. Because of their special construction there are many inaccessible parts that cannot, if at all, be conveniently scrubbed. Therefore, liberal quantities of hot water (180° F. or more) together with plenty of washing powder should be used. The operator is urged to wash and treat the churn after every day's run. Occasional use of lime and chlorine solutions facilitate churn cleaning.

✓ **Sight Glasses in Churns**—Glass windows built in large churns, large storage vats, vacuum pans, etc., to enable the operator to see what is going on within during the operation or the cleaning of the equipment. Sight glasses are, or should be, constructed of pyrex glass, seated with sufficient allowance for heat expansion, or to prevent cracking. When the glass cleans completely and remains free from any butter granule for 8 to 10 revolutions the granules have reached the size of wheat and the churning process can be stopped.

✓ **Sticky Churn**—A condition of the wood of a churn that causes the butter to stick to it. It may be caused either by insufficient chilling of the churn before use, or by the fact that the pores of the wood have become filled with grease, curd, milk salts, etc. The churn may be treated with dilute sulfuric acid to remedy this condition.

The following treatments are:

1. **Rock Salt Treatment of Sticky Churn**—In this treatment of sticky churn, about 300 lb. of coarse rock salt is placed in the churn (standard size factory churn) and a few gallons of water—enough to make a thick mash—are added. The drum with this mixture is then run in high gear from 3 to 5 hours. The action is abrasive in nature, and scours the wood surfaces; the moisture aiding in lifting the material that is choking the pores of the wood. This treatment is followed by several rinses of water and a final scalding.

2. **Acid Treatment of Sticky Churn**—A treatment which consists of filling the churn with acid water, made by adding one quart of commercial sulfuric acid to 100 gallons of water, and running the churn for about one hour. The acid dissolves the material that is choking the pores of the wood. Immediate and thorough rinsing with

fresh water must follow. Sometimes a second rinsing is done with water to which a small amount of soda has been added. This will neutralize any remaining trace of acid.

Butter Cubes—The standard wholesale butter package on the Pacific Coast. The cubes are made of good wood, with inside dimensions of 12¼ x 12¼ x 13½ inches and with a capacity of 69 lb. net at the churn. The cubes are marked 68 lb. because of a possible shrinkage of one pound from creamery to market.

Butter Defects—Some of the principal defects are listed below.

✓ **Brittle Texture**—(Crumbly Texture)—A defect of butter characterized by crumbliness of the butter which makes it difficult to cut. It is believed to be caused by the abnormal firmness and short grain characteristic of winter butter and by processing and storing at low temperatures.

Carton Flavor—A flavor defect of butter sold in cartons or parchment wraps heavily inked. A disagreeable oily flavor caused by the linseed oil in the ink used for printing and absorbed by the butter. Danger of carton flavor might be completely eliminated by drying all cartons before applying paraffin.

✓ **Briny Flavor**—A flavor defect of butter characterized by a salty taste resulting from failure to incorporate salt and water satisfactorily.

✓ **Cheddar Cheese Flavor**—A butter defect caused by sour curdy cream, or by over-ripened cream (thin cream especially), or by the use of an over-ripe curdy starter. Prevention lies mainly in improving the quality of the cream and the starter. The flavor is not volatilizable and cannot be removed after it has once appeared.

✓ **Cheesy Flavor**—A defect of butter caused by excessive bacterial action in cream or starter, especially during the hot summer months. The presence of excessive amounts of butter-milk may also lead to this defect. Large numbers of yeasts and molds often cause distinct flavors resembling Limburger cheese and Roquefort cheese. The common cheesy flavor resembles cheddar cheese.

✓ **Cloudy Brine**—A serious defect of butter evident from the appearance of milky water droplets on the trier. This defect is usually caused by overchurning which prevents proper washing of the buttermilk from the butter.

Coarse Flavor—A term to indicate butter that lacks the delicate flavor and aroma of good butter and yet has no specific off flavor. Coarse flavor is usually caused by a high acid cream, over ripened cream, over ripened starter, excessive salt, or butter in which the salt was not properly incorporated.

Color Specks—Caused by particles of color not evenly worked in the butter.

Cooked Flavor—Generally thought of as a custard flavor. It is caused by pasteurizing cream at a very high temperature. This flavor is most commonly noticed in freshly churned butter which has been made from pasteurized cream. It is not considered objectionable and is permitted in butter scored as high as 93. This flavor usually disappears when butter has been in storage for a little while.

Fishiness, Fishy Flavor—A flavor defect of dairy products particularly butter. It very closely resembles salted mackerel. The chemical compound Trimethylamine, responsible for this flavor, is a colorless liquefiable gas of the fishy, ammoniacal odor, soluble in water, alcohol, and ether. It results from the hydrolysis of the lecithin in the butter or other milk product and the oxidation of the liberated choline. The presence of salt, acid, copper and iron accelerates this defect.

Gasoline Flavor—A rather uncommon off flavor in butter. Its presence is easily detected especially when the sample is heated. The flavor is due to the presence of gasoline or kerosene in the cream from which the butter was made.

Greasy Texture—A body defect of butter. When a sample is taken into the mouth it leaves a greasy sensation. Due quite often to overworking soft butter.

Gritty Salt—A defect of butter caused by the presence of undissolved particles of salt resulting from improperly working the salt into the butter. The addition of dry salt to soft butter before working, use of salt of slow solubility.

Gummy Bodied Butter—Indicated by the tendency to suck to the roof of the mouth and it gives a gum like impression. It is due to abnormally firm condition of the butter fat. It is more prevalent in sections where cottonseed products are fed as the protein supplement in the dairy ration. This defect is not too serious but it does interfere somewhat with the spreading ability of the product.

Leaky Body—Butter which has a wet appearance and when bored shows large beads of water on the plug and a wet trier. Leaky butter generally originates from cream not held long enough at churning temperature followed by improper methods of washing and working.

Mealy Texture—A body defect of butter characterized by a grainy, corn meal type character noticeable when tasting. Meakiness in butter is usually the result of one of two conditions: either a hardened condition of the casein particles brought about by improper neutralization with lime or oiling off due to freezing of the cream and subsequent melting in too hot water, or in adequate agitation during pasteurization and holding.

Metallic Flavor—Indicative of the flavor of metal. It gives a slightly puckery feeling to the mouth. This flavor may be detected as soon as the butter is placed in the mouth but the flavor becomes more intense as the sample is melted on the palate. Metallic flavor is generally attributed to the holding of sour cream in copper or iron lined vats. It is thought that the salts of these metals are carried to the butter. Quite often this flavor is traced to old rusty cans or cans from which the tin has been worn off. The flavor is rather objectionable.

Mottled Butter—Butter which is streaked and uneven in color. This condition appears as the result of an uneven distribution of water droplets in salted butter because of insufficient or uneven working. Large droplets form in the presence of salt giving a deeper translucent color.

Musty Flavor—A flavor defect of butter and often of other dairy products characterized by a lack of freshness. Such flavor resembles the atmosphere and odor of poorly ventilated cellars. Usually the flavor is most noticeable when the sample has been caperated. The flavor lingers.

Neutralizer Flavor—A flavor defect of butter and other dairy products wherein the standardization of the acid present has been improperly done. The presence of a soapy or washing powder flavor suggests the use of soda types, while a bitter taste remains on the tongue when calcium and magnesium neutralizers are used to excess.

Off Flavor—A term used to designate a flavor defect in butter brought about by oxidation of the butterfat.

See Tallowy Flavor

Old Cream Flavor—A common defect of butter brought about by the use of cream of poor quality. This defect may later develop into more serious off-flavors.

Onion or Garlic Flavor—Detected by the distinctive flavor of onion that becomes more intense after holding the sample in the mouth. It is very objectionable in butter and the score is cut as much as 15 points in flavor when this defect is present.

Oxidized Flavor—See Tallowiness.

Rancid Flavor, Rancidity—Hydrolysis splits butterin into butyric acid and glycerin causing the strong pungent flavor and odor in butter which is typical of butyric acid. Commonly caused by improper pasteurization or recontamination with raw cream containing the enzyme lipase and other fat splitting substances.

Salty Texture—A body defect of butter. It is characterized by a lack of grain or texture. The bore fails to show a sharp, even edge, but rather like one cut with a dull knife. Such butter often has a smearly feel to the palate.

Short-Grained Texture—Butter in which the fat globules are small and firm so that they do not pack and cohere readily. Short-grained butter is of brittle or crumbly texture, which is more common in butter made in winter than in summer, due to the predominance of high melting point fat in winter feeds and the relatively small globules in the advanced periods of lactation.

Freezing and subsequent improper thawing may be contributing causes also, due to the loss of colloidal binding properties in frozen casein, and the oiling off of fat. Exposure of butter to low temperatures near the freezing point is another factor. Linseed meal, gluten feed, and other feeds containing low melting point fats, if fed to the cows, will help to correct the defect as will succulent roughage.

Brittleness may be avoided by churning, washing and working the butter at temperatures high enough to secure a fairly soft butter that binds and is readily compacted.

Avoiding excessively low temperatures during holding and cooling is important.

Sticky Texture—A texture defect of butter characterized by the product's sticking to the knife rather than cutting clean. Stickiness is caused primarily by the predominance of hard fats and is most common during the winter months. Lack of succulent feeds, and in areas where alfalfa hay is a major roughage, stickiness often develops. Avoiding holding cream at low tem-

peratures and churning immediately after pasteurization have proven helpful.

Storage Flavor—A rather common off-flavor of dairy products. Milk products which are frequently held in storage for a long time develop the characteristic flavor. There is a lack of freshness. The flavor seems to be retarded and is observed generally during the latter part of the tasting routine. Many compare this to a woody taste.

Surface Taint—A flavor defect of butter characterized by an offensive, putrid odor and taste. This defect begins on the surface of butter and is often classed as a cheesy flavor.

Proper pasteurization, sanitation and a clean water supply are necessary precautions.

Tallowiness—The taste and odor of spoiled tallow in butter, a defect which renders the butter unfit for the market. A bleached color accompanies this flavor development. Tallowiness is due to a decomposition of the butterfat but, unlike rancidity which is due to hydrolysis of the fats, tallowiness is due to oxidation. It may be caused by:

- ✓ 1. Exposure to air, light, or heat.
- ✓ 2. Metals and metallic salts.
- ✓ 3. Excess lactose.
- ✓ 4. Excess neutralizer.

It may be prevented:—

- ✓ 1. By not exposing the butter either in the process of being made or in storage to air, light, and heat.
- ✓ 2. By using bright, non-rusty cans for cream and using only wrappers which are free from metallic rusts.
- ✓ 3. By making butter under the proper conditions with a normal amount of acidity.
- ✓ 4. By careful standardization of the entire operation of neutralizing to prevent over-neutralization. Also, the butter should be protected against contact with alkalis.

Unclean or "dish-raggy" Flavor—This flavor manifests itself by an unpleasant odor which becomes rather intensified as the sample is melted. Some describe this odor as somewhat similar to the one one gets from poorly washed cans with the lid closed tight. Sometimes the odor is spoken of as utensil flavor. In most cases it strongly indicates poor sanitary care of utensils, cans or milk machine equipment with which the milk, cream or butter has come in contact.

Wavy Butter—A color defect of butter indicating the incomplete mixing of two butters having a different shade of color or uneven working of the butter.

Weak Body—In butter this often yields an imperfect plug there being a tendency for the butter to stick to the tiner and it is difficult to break the plug clear. It also has a greasy appearance.

Weak body is thought to be due to incomplete fat crystallization which results in an excess of liquid fat in the butter. It may also be due to incomplete cooling of the cream after pasteurization or to too large a percentage of low melting glycerides in the butterfat.

Woody Flavor—A flavor defect of butter. The flavor may resemble the fragrant, sometimes piney odor of a new churn. It may have the freshness of new hardwood or may have the somewhat musty odor of decayed wood.

Yeasty Flavor—In butter this is easily observed particularly in the early stages of development because it gives a typical fruity slightly fragrant aroma particularly noticeable when the sample is first taken into the mouth. More careful tasting gives a rather distasteful yeasty flavor.

Yeasty flavor is most often encountered in butter made in hot summer months and is due to the by-products formed by yeast growing in the cream, inasmuch as the cream from which the butter was made had undergone decomposition.

Butter, (Dehydrated)—Butter which has had its water content removed in order to prevent rancidity. The butter is first melted, then the fat is floated off the water and serum. The oil is then centrifuged to remove curd and water. Final drying to remove last traces of water, oxygen and other gases is done in vacuum, under agitation. The oil flows into containers. The vacuum is broken, the head space filled with nitrogen and the container is sealed. This butter can easily be reconstituted by the addition of skim milk, water and salt.

The New Zealand Process is said to be as follows: The unsalted whey butter is melted over a jet of steam. The melted fat and condensed steam are run into a cylinder which automatically separates the water that settles out by gravity from the butter fat-water mixture. The fat is then run through cream separators and finally goes through a vacuumator for final dehydration.

See Vaccrated Cream.

Butter, (Dry)—A term generally used to indicate the condition of butter which has been correctly worked in the churn until it appears "dry" that is, until no water droplets can be pressed from a lump of butter between two paddles.

A product prepared thus far only experimentally. To produce butter, only water need be added to the dry material and the ingredients stirred and chilled. Of interest to researchers and processors for its future possibilities.

Butter Exchange—A voluntary trade organization made up of dealers who wholesale butter and sometimes cheese, poultry, eggs, etc. The butter exchange seeks to provide a marketing place, to regulate business dealings of members and settle trade disputes, establish grades and spread such market information as it has acquired.

Butter Extender—A product which when blended with one pound of butter will make up to two pounds of butter spread, depending on amount used. The extender is composed of gelatinized starch, certified color, rennet, powdered buttermilk and salt. This is mixed with lukewarm milk then blended with the butter and cooled. Not much used and generally confined to home blending.

Butterfat—See Milk Fat.

Butter Flavors, (Artificial)—These commercial products contain two important flavor substances of starters, viz: diacetyl and acetoinethylcarbinol.

Their use in flavoring butter was ruled illegal in 1933 by the Chief of the Food and Drug Administration of the U.S.D.A.

Butter for Tropical Areas—A butter spread developed in Australia for use in the tropics has better keeping qualities than regular butter which easily becomes rancid in hot climates. This product is made from dehydrated butter, to which have been added hydrogenated butterfat, salt, and skim milk powder. This spread is like butter in taste and appearance, but has a higher food value and a higher melting point (106° F) than butter (80° F). Sealed in tins.

Butter Grading—See Butter Standards and Butter Scoring.

Butter Grain Texture—In butter, the condition in respect to its minute, microscopic structure. The texture of butter depends upon its grain.

Butter Granules—Small particles of butter which form in the churn toward the end of the churning process and are indicative of the completion of the churning. The churn is usually stopped when these granules are the size of wheat or corn kernels.

Buttermaking, Continuous Process*—The continuous buttermaking processes developed by The Creamery Package Manufacturing Company and the Cherry-Burrell Corporation are among the most modern means of producing butter. Continuous buttermaking methods have introduced a new concept of manufacturing to the creamery industry.

It is possible with the continuous system to process the incoming raw milk from the farm into the finished quarter pound butter prints, cartoned and boxed ready for distribution to the consumer in one continuous operation.

This process provides accurate temperature and ingredient control. The processor can vary flavor by minute degrees to meet demands of individual markets, and the consistency of body, composition and flavor can be accurately maintained to smaller tolerances than possible with churning in spite of seasonal changes in fat. Since most of the solids not fat and moisture are removed at the very start of the process, the flavor is particularly clean and fresh tasting.

The equipment and procedures used in this process provide controlled seeding of butter crystals and finely dispersed moisture which results in a body that is close in grain texture and smooth and waxy with perfect salt and moisture distribution. The shrinkage, always encountered in the production of butter in batch type churns (both in printing and storing), is eliminated, and pin point composition control permits the operator to standardize closer to the 80% fat limit with a corresponding saving in butterfat.

In the continuous process all of the solids not fat are removed in the form of skim milk which touches only sanitary stainless steel surfaces. This allows these solids to be used in the production of fine quality low heat powder at a substantially greater return.

Because these solids not fat are removed in the form of skim milk from a conventional heavy products separator, the butterfat loss is reduced to that which normally results from an initial separation.

Fat loss can be controlled easily because all the fat leaves the system at only one

point and can be readily checked in the skim milk.

By making use of the continuous procedures the labor required per pound of butter produced is substantially reduced and that required can be better utilized. Unlike the hard manual labor connected with the old-fashioned buttermaking, the labor with the continuous method is light work which likely is more appealing to the young man entering dairy processing work today.

Since the equipment consists of a modern design of all stainless steel, it should operate for many years at an absolute minimum of maintenance and replacement expense. It provides for ease in increasing the capacity of the installation, and generally, the floor space required is less than that needed for buttermaking with churns.

By the addition of a few selected pieces of equipment to the basic Continuous Buttermaking Equipment, butter, anhydrous fat or plastic cream can be made continuously on the same line. Production can be alternated on a daily, weekly, monthly or irregular basis as desired, and the same working crew can be used for any of the products. A minimum of previous experience or skill is necessary for any of the products since high quality is a result of mechanical processes rather than the art of the individual workman.

The Process

In the production of butter on a continuous basis there are six physical changes according to the Creamery Package Method:

1. Concentration to cream of 80% fat content.
2. Reversal of fat phase from fat-in-serum to serum-in-fat.
3. Concentration from 80% to 98% fat.
4. Pasteurization and cooling 98% fat.
5. Composition control of the butter mix
6. Controlled solidification and crystallization of the butter.

The procedure of the "Golden Flow Continuous Buttermaking System" as a result of the Cherry-Burrell Corporation's research work is about as follows:

The cream is received in the usual manner. As the first step in the manufacturing process, the cream is pumped through a strainer to the destabilizing unit. The cream should be in the temperature range of 65-75° F. at the time of destabilization. Following destabilization, the cream goes direct to the centrifugal heater where it is

heated to 125-150° F. The cream then goes to the centrifugal separator. The light and heavy-skim milk is piped away to be dried and the fat concentrate is pumped to the Vacreator for pasteurization. The pasteurized concentrate is collected in special 300 or 600-gallon stainless steel composition control tanks where it is standardized to the desired composition and if necessary acidity. The concentrate is then chilled and worked and finally discharged from the Texturator as butter.

Apparently the most successful continuous buttermaking machines in this country are made by Cherry Burrell Corporation and Creamery Package Manufacturing Company from whom more detailed information can be secured. Machines of this type have also been developed and are being used in Germany and other European countries.

* Abstracts from papers by H. L. Mitten, Jr. and D. C. Roehen, Research Engineers, Creamery Package Manufacturing Company and A. H. Ruhoff, Research Department, Cherry Burrell Corporation, Editor.

✓ **Buttermaking**—See *Origin and Development of Buttermaking* and *Outline of Buttermaking Process* in Handbook.

✓ **Butter Moisture Scales**—A special balance equipped with beams and weights to facilitate the determination of the per cent of moisture, fat, curd and salt in butter.

✓ **Butter Oil**—A commercial product made by centrifuging melted butter from cream by the North Process (patented). Butter oil when made from a good grade of butter or cream is subject to little deterioration under proper storage conditions. When of high quality it is convenient for use in making high quality ice cream, especially in places where fresh cream and other sources of fat are scarce. However, when butter is made from it the product must be labeled as renovated butter.

✓ **Butter Oil, (North Process)**—A patented process by which butter oil is extracted directly from cream without the necessity of first churning the cream into butter. The undesirable curd material is eliminated by running the nearly churned cream into hot water, thus causing precipitation and setting of the curd. The oil is purified by centrifuging.

Butter Oil with Bland Flavor—A form of dehydrated butter much used in the confectionery industry. The proteins and other constituents are first removed by coagulation and straining; the oil then is heated not higher than 110° C. (230° F.) to pre-

vent any cooked taste. The natural antioxidants normally in the butter are transferred to the oil to give it a bland, uncooked flavor.

✓ **Butter Over run**—Over run constitutes the difference in weight of the butter and of the fat used to make the butter. It is generally expressed as the percentage increase on the basis of the fat used. The explanation for this is that in the finished butter there is included a certain percentage of water, curd and salt. The per cent of over run is determined by dividing the pounds of over run by the pounds of butterfat. The per cent of over run in efficiently operated creameries varies from 22% to 24.5%, dependent upon whether fat is purchased in milk or cream. Example: Assuming that the butterfat composition of butter is 80%, the calculated amount of butter that could be made from 100 lb of butterfat would be

$$\frac{100}{80} \times 100 = 125 \text{ lb of butter}$$

and 125 lb butter — 100 lb fat used = 25% over run. This is the theoretical over run. Allowance of course must be made for mechanical losses in the manufacturing process.

Butter Packer—A person who packs butter for shipment. A mechanical device which packs butter.

Butter Packing Tools—Tools which assist in the packing of butter in tubs or cubes. They consist chiefly of wooden tampers and ladles.

Butter Prints—Individual packages of butter for retail trade. Most of the butter sold at retail is marketed in this form. Prints are available in two-pound prints or rolls, one-pound prints, one-half pound prints and bars and one-quarter pound prints. The one pound print measuring 2½ x 2½ x 4 inches wrapped in parchment and sold in a carton is most popular. One pound prints are quite commonly put up in the form of four one-quarter pound prints or two one-half pound prints wrapped separately in the regular one-pound carton.

Butter, (Process or Renovated)—Butter which has been subjected to any process by which it is melted, clarified or refined and made to resemble natural butter.

Butter Scores as defined by Dr. O. F. Humziker—93 Score Butter shall possess fine flavor. It may possess a very slightly normal

eed or slightly cooked flavor. It is made from cream to which a culture (starter) may or may not have been added. The total permitted defects in body, color, and salt are limited to a rating of one-half."

"92 Score Butter shall possess a pleasing flavor. It may possess a slightly normal feed, slightly storage, slightly heated cream (summer defect), slightly flat, slightly coarse-acid, or a definitely cooked flavor. The total permitted defects in body, color, and salt are limited to a rating of one-half unless the flavor rating is sufficiently high to permit the total ratings for defects in these factors to exceed one-half; provided, however, that the total ratings for defects in body, color, and salt do not exceed one in 92 score butter regardless of the flavor rating."

"91 Score Butter shall possess a fairly pleasing flavor. It may possess any of the following flavors if present only to a slight degree: acidity, utensil, scorched, neutralizer, aged (butter), greasy, woody, bitter, and old-cream. It may possess any of the following flavors even when present to a definite degree: storage, normal feed, heated cream (summer defect), flat, coarse-acid, and smothered. The total permitted defects in body, color and salt are limited to a rating of one-half unless the flavor rating is sufficiently high to permit the total ratings for defects in the factors to exceed one-half."

"90 Score Butter shall possess a fairly pleasing flavor. It may possess any of the following flavors if present only to a slight degree: cabbage, turnip, potato, rape, weedy (ordinary-common), and musty. It may possess any of the following flavors even when present to a definite degree: Acidity, utensils, scorched, neutralizer, aged (butter), greasy, woody, bitter, old-cream. The total permitted defects in body, color, and salt are limited to a rating of one-half unless the flavor rating is sufficiently high to permit the total ratings for defects in these factors to exceed one-half."

"89 Score Butter may possess any of the following flavors if present only to a slight degree: Fruity, yeasty, cheesy, oily, metallic, and barny. It may possess any of the following flavors even when present to a definite degree: Sour, scorched-neutralizer, scorched-old cream, alkaline, cabbage, turnip, potato, rape, weedy (ordinary-common), musty, and stale-cream. The total permitted defects in body, color, and salt are limited to a rating of one unless the flavor rating is sufficiently high to permit the total ratings for defects in these factors to exceed one."

"88 Score Butter may possess a slightly obnoxious weed flavor or any of the following flavors even when present to a definite degree: Fruity, yeasty, cheesy, oily, metallic, cabbage, turnip, potato, rape, and barny. It may possess any of the following flavors even when present to a pronounced degree: Alkaline, musty, and stale-cream. The total permitted defects in body, color, and salt are limited to a rating of one unless the flavor rating is sufficiently high to permit the total ratings for defects in these factors to exceed one."

"87 Score Butter may possess a fishy, onion and garlic flavor if present only to a slight degree. It may possess an obnoxious weed and barny flavor even when present to a definite degree. It may also possess a yeasty and cheesy flavor when present to a pronounced degree, and a stale-cream flavor when present to a very pronounced degree. The total permitted defects in body, color, and salt are limited to a rating of two unless the flavor rating is sufficiently high to permit the total ratings for defects in these factors to exceed two."

"86 Score Butter may possess any of the following flavors: Definitely fishy, definitely onion or garlic, and pronouncedly obnoxious weeds. The total permitted defects in body, color, and salt are limited to a rating of two unless the flavor rating is sufficiently high to permit the total ratings for defects in these factors to exceed two."

"85 Score Butter may possess a pronouncedly obnoxious weed, onion, and garlic flavor. The total permitted defects in body, color, and salt are limited to a rating of three unless the flavor rating is sufficiently high to permit the total ratings for defects in these factors to exceed three."

Butter Scoring—The examination of butter to determine its grade upon the basis of flavor, aroma, body and texture, color, salt, and package, and its rating (score) in accordance with generally accepted U. S. Butter Standards.

Butter Spread—Butter mixed with other food products in such a way as to increase the quantity of resulting product.

See Butter Extender, Butter for Tropical Areas, and Butter, whipped.

Butter Starter—A special prepared culture of lactic acid bacteria (*S. lactis*) and associated species of bacteria (*S. citrovorus*, *S. paracitrovorus*) developed under careful laboratory conditions, often used for the purpose of developing desirable acidity, flavor

and aroma. It is used in buttermaking, cheese making and in the manufacture of fermented milks and sour cream.

This pure culture from which the mother starter is made is generally obtained from a commercial bacteriological laboratory.

Also called Seed Starter

Mother Starter—The small culture of starter which is carried from day to day and from which the bulk starter is inoculated. Also called starter culture or startoline. Generally carried in 1000 cc flasks or quart jars.

Bulk Starters—Large quantities of starters such as are used in commercial buttermaking are prepared by inoculating large quantities of milk with the small starter ("mother culture") which previously has been prepared in glass jars. Starter vats are generally employed for this purpose. These permit exact temperature control and should preferably not be used for any other purpose. Stainless steel vats are most suitable. Carelessness in the making of bulk starter is often the cause of off flavors in the butter. The amount of bulk starter used should equal at least 1% of the weight of the cream or milk to be ripened.

Butter, Sweet—Butter containing a minimum of 80% butterfat and to which salt has not been added.

See unsalted

Butter Test—See Dairy Tests

Butter Test (Modified Babcock)—See Dairy Tests

Butter Trier—An open metal tube with a handle used to take a representative sample from a package of butter. It is totally inserted into the butter and turned around once. It is then drawn out bringing with it a long round plug of butter.

Butter Tub—A paraffined tub shaped, wooden container for use in packaging of butter. Butter tubs are usually constructed of white ash or spruce. While they vary in size considerably, the 62 to 63 lb tub is by far the most widely used. Tubs are lined with parchment. 30-lb and 10-lb tubs are also available.

Butter Truck—A large wooden container on wheels into which butter churnings are loaded for chilling and future printing.

Butter, Unsalted—See Unsalted Butter

Butter, Washing—The practice of adding water to the churn, after drawing off the buttermilk from the butter, and revolving the churn in low gear for a few revolutions. The wash water is then drawn off. The chief purpose of washing butter is to free the butter granules from whatever butter milk still adheres to them. If the granules come abnormally soft, allowing the butter globules to remain in cold wash water for 1½ to 20 minutes will facilitate completion of buttermaking operation.

Butter, Whipped—To meet the demand of those who prefer larger quantities of air in their butter and also who wish to extend or stretch the amount of butter in the spread, especially in times of shortage, several types of whipped butter are available. Some of them are made by just whipping or incorporating air with the butter and others have added ingredients.

The following recipes offer considerable choice in this product.

Whipped Butter—100 lb butter salted, 50 ml. butter color and 8 oz. salt.

Soften to about 65 to 75° F. Add salt and butter color and then whip until an over run of 50% to 100% is obtained. It is then packaged and refrigerated at 40° F.

Whipped Butter Spread—50 lb butter, salted 50 lb 19% cream, 90 ml. butter color, 25 ml. starter distillate and 6 oz. salt.

Soften butter to 65 to 75° F. Add butter color, starter distillate and salt with cream and then whip until an over run of 50% to 100% is obtained. It is then packaged and refrigerated at 40° F.

Stabilized Homogenized Butter Spread—55½ lb butter, salted, 35 lb skim milk, 27 lb skim milk powder; 7 lb water; 5/10 lb Danisco 75 ml. butter color; 25 ml. starter distillate and 5 oz. salt.

Soften butter to 65 to 75° F. Add other ingredients and whip until an over run of 50% to 100% is obtained. It is then packaged and refrigerated at 40° F.

Butter Worker—A machine used in working butter. Although there is a great variety of butter workers, they may be classed into two principal groups, the first group being workers which are independent of the churn and to which the butter must be transferred for working. The second group comprises those workers which are a part of the churn. These are commonly called combined churns and workers and are used in most creameries.

Butter Wrapping Machine—A machine which wraps butter. After the butter has been cut it is placed on conveyors or feeding boards which have a forward motion. These feeding boards are so arranged that the end of the print rests on the stationary guides at each side of the feeder, with only enough slippage to insure a perfect feeding device that does not require attention or watching. The butter will feed to the wrapping heads without being pushed or crowded forward by hand—the feeding boards do that. The parchment is mounted on brackets provided above and to one side of the perforation attachments which punch date and churn number in the paper which wraps each print.

Canned Butter—Butter packed into non-absorbent, hermetically sealed tin cans, holding from $\frac{1}{4}$ to 5 kilograms. The object of packing in tins is to prevent leakage of water, and oil, and to preserve the keeping quality of the butter by exclusion of air. Canned butter is used in tropical regions and on ships.

Centralized Creamery Butter—A term referring to butter made in a large creamery. Cream used in the manufacture of this butter may be gathered direct from the farmers or shipped in from cream stations or it may be shipped in directly to the creamery by rail or truck from individual farmers.

Clarified Butter—See Ghee.

Creamery Butter—Also called Factory butter. Butter made in a creamery, milk plant or condenser which receives its milk or cream supply from more than one farm.

Cultured Cream Butter—See Ripened Cream Butter.

Crumbly Butter—See Short-grained Butter.

Dairy Butter—See Farm Butter.

Dry Salting in Butter—Dry salt is sprinkled evenly over the granular butter in the churn, or on the butter as it comes up on the shelf of the revolving worker while in low gear. The butter is then worked until salt is evenly distributed.

Dumping Up—An expression in common use in New Zealand for the high speed running of the churn after draining and washing, for the purpose of consolidating the butter granules.

Farm Butter—Butter made on a farm from cream produced on that farm. It is churned from raw or pasteurized cream which has been allowed to sour either naturally or

with starter added, and has a variable composition.

Firkin—A small wooden barrel or cask used chiefly in the Scandinavian countries for packing butter for export trade. The average capacity of a firkin is 112 lb. of butter.

Gallup Number—An index of the hardness of butter fat. It is the number of grams (of mercury) required to force a plunger of 5 mm. diameter and weighing 50 gms. through a disc of butter fat of 6 mm. thickness at 20° C. (68° F.).

Ghee—Ghee is the name given in India to butter from which the water has been driven off by heat, the salt and curd being allowed to settle and the fat filtered off. It can be made from fat from the milk of the cow, buffalo, goat, or sheep. Ghee has somewhat the same chemical composition as butter fat but with a lower Reichert-Meisel value.

Note: (Natives of India often add foreign fats to butterfat, lowering R-M to minimum standard).

Grease Butter—A former classification of butter which includes butter below cooking grade.

Held Butter—Butter that has become cold storage butter by virtue of the laws of the state in which such butter is sold.

Hermetically Sealed Butter—See Canned Butter.

Ladled Butter—Butter which has been collected in humps, rolls or wholesale packages and reworked.

Lur Brand—A brand of butter put out by the Danish Butter Mark Society which adopted the Lur as a collective mark for all butter exported by its members. The Lur mark represents two pairs of "Lurs" or trumpets, such as were used by Scandinavian Vikings during the bronze age.

Overrun, Final—The difference between the amount of butter sold and the amount of fat purchased for the making of butter.

Overrun, Plant—The difference between the amount of butter obtained and the amount of fat contained in the milk or cream used for making the butter.

Packing Stock Butter—Butter of a quality and condition unfit for consumption and fit for use only in ladled or process butter.

Pasteurized Cream Butter—Butter made from cream which has been pasteurized prior to churning.

Print Butter—Butter packages in individual form for retail trade. Prints vary in size from $\frac{1}{4}$ lb to 2 lb lots. The 1 lb print measuring $2\frac{1}{2} \times 2\frac{1}{2} \times 4\frac{1}{2}$ in wrapped in parchment and sold in a carton is most popular. One pound cartons made up of 4 $\frac{1}{4}$ lb or 2 $\frac{1}{2}$ lb prints wrapped separately have become popular.

Process Butter—Butter resulting from the melting, refining and reworking of a low grade of butter. Also called renovated butter.

Renovated Butter—See Process Butter.

Reworking Butter—This is not usually a good practice as it nearly always decreases the keeping quality and palatability of the butter. It also seems to break up the bacterial clusters and gives the bacteria a better chance to contact their food supply and increase their numbers. Reworking is necessarily resorted to in order to reduce the moisture content of butter having excess moisture. The excess moisture can in this way be expelled particularly if the butter has been chilled in the cooler before reworking.

Some creameries also are increasing the moisture content by working the butter in the presence of moisture. Because of its effect on quality of butter reworking should be discouraged.

✓ **Ripened Cream Butter**—Butter made from cream which has been ripened by use of a starter in order to develop a desirable flavor and aroma.

Also known as Cultured Cream Butter.

See Starter.

✓ **Ripening Vat**—A tank or vat usually of stainless steel or glass-lined construction used as a container for the ripening of cream which has been inoculated with starter. The ripened cream may then be used for butter making. Ripening vats are also used in the process of making cultured buttermilk.

Rum Butter—See Recipes for Dairy Dishes.

✓ **Salted Butter**—Butter to which salt has been added. The amount added averages from $1\frac{1}{2}\%$ to 3% by weight of the butter. Nearly all butter for household use is salted. Butter is salted to improve keeping quality to season it and to suit the requirements of the trade.

Samna—A butter oil produced in Egypt somewhat similar to Ghee an Indian product.

Sweet Butter—See Butter Sweet.

Sweet Cream Butter—Butter made from fresh sweet cream which at no time before or during manufacture shows more than 0.2% acidity. The cream is produced without the use of a butter culture and without cream ripening. Sweet cream butter lacks the flavor and aroma of ripened cream butter but its keeping qualities are better. This butter generally contains from 2% to $2\frac{1}{2}\%$ salt.

Swiss Butter Printer—A butter printer used for printing soft butter directly from the churn. The use of this machine eliminates the necessity of rehandling bulk butter packed in tubs or in cubes and shipped to distribution centers for printing. Although the machine is rather expensive considerable savings are made in more accurately weighed prints, less handling and direct sales of print butter from the creamery.

Tub Butter—Butter packaged in tubs which usually hold from 62 to 63 lb.

✓ **Unsalted Butter**—Butter containing no added salt. This butter is popular with many consumers and in addition it offers a convenient means of storing surplus butterfat for later use in dairy manufacturing.

Unsalted butter is next to sweet cream in importance as a source of fat for ice cream making.

✓ **Wash Water (Butter)**—Water used for washing down butter granules immediately following the churning process to rid them of excessive curd and acid. Wash water is also used in cheese making for the types of cheese in which there is excessive acid in the curd or for those types where it is desirable to remove excess lactose by diffusion. In types such as brick only a small amount of lactic acid is developed during the making process.

Whey Butter—A butter made from the cream obtained by running the cheese whey through a separator. It is comparable in composition and in most instances in flavor to ordinary butter but does not have the keeping quality of butter. It must be legally marked 'whey butter' in many states.

One thousand lb of whey yields about 25 lb of butterfat.

✓ **Working (butter)**—An important step in the manufacture of butter. Agitation of the butter after churning in order to completely

dissolve, incorporate and distribute the salt, and color, to control the moisture content of the butter, and to bring the granules of butter together into the proper texture structure; in general, to produce a desirable body and texture out of loose granules.

Yeasts and Molds in Butter, Determination of—See Milk Industry Foundation Manual and Butter Institute Manual.

End of Butter Terms

Butterfat—The fat of butter or of milk. The term is often used to include not only the actual fat (triglycerides) but also the pigments and vitamins dissolved therein.

See Milk Fat.

Butterfat, Anhydrous—A 99.5% butterfat product.

See Butter oil.

Buttermilk, Natural or Genuine; Buttermilk, Dry; Buttermilk, Cultured—See Milk, Buttermilk.

Buttermilk Cheese—See Cheese.

Buttermilk Fat Test—See Dairy Tests.

Buttermilk Lemonade—See Milk Drinks.

Buttermilk Powder—Spray dried sweet cream buttermilk powder, made for bakery use.

See Milk—Powder.

Buttermilk (Powdered), Composition of—See Milk Powder.

Buttermilk, Wheying off—See Milk, Buttermilk.

Butter Yellow—The dye paradimethylaminoozobenzene, popularly called "butter yellow." According to the U.S. Food and Drug Administration, this dye should not be used as a food color and may not be certified for such use. Only those coal tar dyes which are certified by the Food and Drug Administration as suitable for use in foods may legally be added to foods shipped within federal jurisdiction.

Buttery Texture—See Ice Cream Defects.

Buttons—See Dried and Evaporated Milk Defects.

"Buttons"—Hardened colonies of sugar-tolerant molds growing upon the surface of condensed milk exposed to the air.

The young horns in calves while still under the skin are also referred to as "buttons."

The clear white ends of the back bones

(vertebrae) in young cattle also are called "buttons"—the age of the animal can be obtained roughly by noting the size of these; they grow smaller with age.

Butyl Alcohol Test—See Dairy Tests.

Butyric Acid— C_3H_7COOH . A volatile fatty acid present in butter fat to the extent of about 3.5%. Responsible for the pungent odor upon hydrolysis of butterfat in dairy products, generally thought of as rancidity. However, rancidity may be due to excessive amounts of lipase in the milk itself or due to the production of butyric acid by certain molds and bacteria.

Butyric Acid Bacteria—A group of bacteria which produce butyric acid as a fermentation end product. This is accompanied very often by gas formation and results in very undesirable flavors and odors. A spore-bearing organism, *Clostridium butyricum*, is capable of this action.

Butyric Acid Bacteria, Test for—See Dairy Tests.

Butyrin—A milk fat, combination of butyric acid with glycerol, which forms about 3.8% of butterfat. Hydrolysis of butyrin is largely responsible for rancidity in dairy products.

Butyro-refractometer—A modified form of a refractometer devised for use especially with butter. On this instrument the scale is in arbitrary units covering the range of butter, lard and their substitutes. It measures the angle through which the light is bent or refracted by passing through a thin film of the melted butter, and is recorded as the refractive index.

Butyrometer—The test bottle used in the Gerber-Fucoma Test for fat in milk or cream.

Buyer's Market—A market in which the buyers set the price; hence, a market of prevailing low prices.

Buying Club for Dairy Products—In Sweden, Denmark, England and certain states in the United States, an organization of consumers for the purpose of bargaining collectively with a dairy or dairies to obtain milk for its members at lower than retail price. Because of its bargaining power the club is able to get a wholesale or near wholesale price. After this price has been arranged the members deal with the dairy in the usual way. In this particular, the buying club differs from the Consumers' Milk Cooperative which not only bargains for the price but buys the milk from the producers and sells

to the cooperative members direct without the services of the middleman the distributor

By-products—The residues remaining from

the manufacture, processing and sale of the primary dairy products, milk, cream, butter, cheese and ice cream. They consist primarily of skim milk, buttermilk and whey and the products made therefrom

C

Cabbage—See Cheese Defects (Swiss)

Cabbage—See Feeds and Feeding

Cabinet Cooler—See Milk, Processing and Processing Equipment

Cacao—The bean of the cacao tree (*Theobroma Cacao*), from which chocolate, cocoa, and cocoa butter are made. The cacao bean grows in tropical climates; is native to Central America, and is today produced in South America, Central America, Mexico, the West Indies, Africa, Ceylon and the Dutch East Indies. Color, flavor, aroma composition, and thickness of the skin vary with soil climate and variety of cacao, thus providing considerable selection and possibility of blending in the manufacture of chocolate products.

The almond-sized cacao beans or seeds develop in a large pulpy pod—20 to 30 beans to the pod. The ripened pods, rich golden red in color, are cut from the trees gathered in piles and left to ripen further for about 48 hours after which they are cut open, the beans removed and placed to vats or bags to heat and ferment for about ten days or until the characteristic flavor and cinnamon-red color develop. The beans are then washed clean of the dried pulp, are dried slowly and sufficiently to prevent mold growth, and are then sorted and graded prior to shipment to manufacturers of chocolate and cocoa.

At the factory the beans are first mechanically cleaned. Then they are roasted to drive off the moisture and to bring out the special chocolate flavor and aroma. The roasted beans are then cooled quickly by forced air, and are next run through a winnowing machine which crushes them into small pieces and separates the shells from the nibs (the seeds) which are made into chocolate and cocoa. These nibs, containing approximately 50% of the fat of the bean, are then placed between heavy stone grinders or mills which reduce them to a liquid by the heat created by the friction of milling. The trade name for this liquid is chocolate liquor or pure bitter chocolate.

See Chocolate. Chocolate Liquor. Cocoa, American Process Cocoa, Dutch Process Cocoa. Cocoa Butter. Cocoa Nibs.

Cacio Fiore; Cacio Romano; Caciocavallo; Caciocavallo Siciliano—See Cheese

Cacti, Caddo Cake—See Feeds and Feeding

Cadmium Value—A measure of the amount of lower fatty acids, especially butyric, capric and caprylic in milk fat.

Caerphilly—See Cheese

Cafe au Lait—See Milk Drinks

Caked Udder—See Diseases in Cattle

Caking—See Defects of Dried and Evaporated Milk

Cakigno—See Cheese

Calciferol—See Vitamins

Calcium (lime)—An alkaline earth metallic element, Ca, which never occurs in a free state in nature, but occurs most commonly as calcium carbonate or limestone, CaCO_3 . It is essential to plant growth. Its compounds also occur in blood, bones and teeth and in the fetuses of animals and man. Lack of calcium in the diet causes poor teeth and rickets. Milk fever is associated with lack of calcium in the blood stream. Milk is one of the best sources of calcium in the diet, containing about 1.25 gms per liter.

Metallic calcium is silver white, hard, tough and malleable, with a specific gravity of 1.85 and a melting point of 760°C .

There are many important calcium compounds such as C. phosphates, C. silicates, C. sulfates, etc. They have many uses in medicines, fertilizers, insecticides, brines for refrigeration, sterilizing materials, etc.

Calcium Carbonate—Carbonate of lime. Limestone CaCO_3 .

Calcium Caseinate—The calcium "salt" of the milk protein, casein. Actually it is not a salt of definite composition but rather consists of casein (which is itself a mixture of proteins) associated with an amount of calcium depending on the pH of the solution. Casein binds calcium rather tenaciously and calcium causes aggregation of casein particles.

Calcium Chloride— CaCl_2 . A readily soluble salt widely used as the salt in brine in dairy refrigerating systems. Also used in Cheese-making. — See Cheese.

Calcium Cyanamide—A synthetic calcium-nitrogen fertilizer containing approximately 22% nitrogen. Also used to some extent for its value in destroying germinating weed seeds and seedlings. CaCN_2 . Very poisonous.

Calcium Equivalents in Dairy Foods—1 glass milk, 1 serving cheese (1¼ ounces), 1¼ cups light cream, 2 servings ice cream (1/6 quart servings), 3 servings cottage cheese (½ cup servings). All give about the same amount of calcium.

Calcium Hypochlorite— CaO Cl_2 . A combination of chlorine and lime. Also known as bleaching lime. Used in making chlorine solutions for sterilizing utensils.

Calcium-Phosphorus Ratio—See Feeds and Feeding.

Calcium Requirements in the Diet—

	<i>Grams</i>
<i>Individual</i>	<i>Calcium</i>
Normal adult,	0.80
Children (up to 20 years)	1.40
Pregnant mother	1.50
Nursing mother	2.00

The ordinary mixed diet of the average American household provides the following amounts of calcium:

	<i>Grams</i>
<i>Daily Food Intake</i>	<i>Calcium</i>
Regular serving of meat, potato and bread	0.029
Two eggs	0.101
Regular servings of fruits and vegetables	0.153
<hr/>	<hr/>
The above foods total	0.263
One pint of milk adds	0.830
One large serving (1/6 qt.) ice cream	0.170
<hr/>	<hr/>
Total	1.293

This provides a total well above the absolute needs of adults. If children and

pregnant mothers take another half pint of milk daily their calcium intake will be abundantly sufficient.

Calculating Cost of Ice Cream Mixes—See Ice Cream.

Calculating Feed Mixtures—The calculating of feed mixtures is a method of figuring, by using the weight of the cow, her production and the test of her milk, her daily requirements of protein and total digestible nutrients, and then calculating the amount and proper kind of feed to give her in order to meet these requirements. Sometimes her requirements for other things, such as minerals and vitamins are also calculated.

Calculations, Importance of—See Ice Cream.

Calculus—See Diseases in Cattle.

Calf—The young in any species of cattle of genus *Bos*. In animal husbandry, the name applies to the young animal up to 6 months of age, the time at which sex maturity usually begins.

Calf Book—Part of a book included in the Dairy Herd Improvement Association record book in which a record of a calf's identity is kept. It includes name and number, date of birth, name of sire and dam, and the like.

Calf Diphtheria—See Diseases in Cattle.

Calf Feeder—A device which contains feed and supplies this feed continuously to the animal by gravitational force. As the feed is being depleted in the trough, more comes down from the top by force of gravity.

Calf Herd—A group classification of dairy cattle for the show ring. It consists of 1 bull and 2 heifers, all under 1 year of age and bred by the exhibitor.

"Calf starters"—See Feeds and Feeding.

Calf Weaner—A device placed over a calf's mouth to prevent it from sucking its mother or another calf.

Calhood Vaccination—The practice of vaccinating calves to prevent brucellosis (Bangs disease).

Calgon—Calgon is the common or trade name of sodium phosphate glass (formula $1.1 \text{ Na}_2\text{O} \cdot 0.1 \text{ P}_2\text{O}_5$) which has good detergent properties.

Calibration of Babcock Glassware—See Dairy Tests.

California Bur Clover; California Clover; California Wheat—See Feeds and Feeding

Call, The—The competitive public bidding and selling of commercial products on the floor of the Produce Exchange. It facilitates buying and selling and establishes market prices. Butter is marketed by this process although the great bulk of butter handled by the members of the Exchange is sold in private deals between buyer and seller.

Call Board—See Cheese

Calorie—A unit of energy used in nutritional calculations. It represents the amount of heat required to raise the temperature of 1 000 grams (1 Kilogram) of water 1° C (33.8° F). A quart of milk furnishes energy equal to about 665 calories. A calorie may be referred to as a large or small calorie. A large calorie refers to the kilogram calorie and is very nearly the same as the heat required to raise 4 pounds of water 1° F. A small calorie is the amount of heat necessary to raise the temperature of 1 gram of water 1° C. In the absolute calorie unit this rise of temperature is from 15 to 16° C (59° to 60.8° F). Usually the small calorie or gram calorie is written uncapitalized and the large calorie is written capitalized.

Calories in Dairy Foods—

Food	Average Serving	Calories
Whole Milk	1 glass (8 oz)	170
Fat free Milk	1 glass (8 oz)	85
Buttermilk	1 glass (8 oz)	85
Cheese, American	1 ounce	110
Cottage Cheese	½ cup	100
Cream Cheese	2 tablespoons	110
Cream, coffee	2 tablespoons	65
Cream, heavy	2 tablespoons	120
Cream, whipped	2 tablespoons	60
Half and half	¼ cup	80
Butter	1 tablespoon	100
Ice Cream, vanilla	½ quart (¾ cup)	200

Calorimeter—An instrument for measuring calories, i.e. the heat change in any system.

Calved—Having had a calf or calves, as, the cow has calved.

Calving Interval—The time between freshening of female animals. In dairy cattle, it is recommended that this interval be twelve months but this is often difficult to reach in practice.

Calk, also Caulk—To drive tarred oakum or other filling into a crevice or seam to prevent leaking.

Cam—A rotating or sliding piece of mechanism, designed to give a peculiar movement to another piece of metal or machine.

Camwheel—A wheel set or shaped so that it acts as a cam.

Cam shaft, also Camshaft—A shaft on which a cam is secured or of which a cam forms an integral part.

Cambridge, (York); Camembert; Camembert, Composition; Camosum—See Cheese

Campbell Process—See Milk, Processing and Processing Equipment

Can Filler—A machine for filling milk cans ranging in capacity from 4 to 12 quarts. It consists of a large tank with valves similar in design to those on a bottle filler, but much larger.

Can, Milk—The common milk can has a capacity of 10 gallons though there are a number of 5, 1 and 2 gallon sizes. These are usually made of iron and heavily tinned. Recently stainless steel has been used to some extent. The trend towards farm bulk tanks and tank trucks is greatly lessening the use of cans.

Can, Sanitary, Valve venting—See Milk, Processing and Processing Equipment

Can Washer—A piece of equipment for washing cans in dairy plants. Can washers vary in size from a single jet of hot water and steam to the large hydraulic washers. The larger washers are of either the straight away or rotary type the latter requiring less floor space and but one man's labor.

Can Washer, (Straightaway)—An automatic washer where unwashed cans are placed in one end and deposited at the other end in a sterile, dry condition by a conveyor.

Canada Bluegrass—See Feeds and Feeding

Canadian (Quebec) Jerseys—Said to be the same as French-Canadian.
See French-Canadian

Cancer Eye, (Carcinoma of the Eye)—See Diseases in Cattle

Candle Plug, (in cheese)—See Cheese

Cane, Cane Hay, Sweet Sorghum Hay—See Feeds and Feeding

Cane Knife—A heavy wide bladed hooked knife used for cutting sugar cane, or green corn.

Cane Molasses—See Feeds and Feeding

Canned Butter—See Butter.

Canned Cheese—See Cheese.

Canned Cream—See Milk, Cream.

Canned Milk—See Milk, Condensed and Evaporated.

Canner—In livestock marketing, an animal of the poorest grade; a cutter.

Canner Grade Beef—See Specifications for Official U. S. Standards for Grades of Carcass Beef (Steer, Heifer, and Cow), Grades of Bull Beef Carcasses and Grades of Stag Beef Carcasses, under Beef Carcass.

Cannery—A building, with facilities and equipment, for processing edible products, as fruits, vegetables, meats, etc.

Cannon Bone—In hoofed quadrupeds, the bone supporting the leg from the knee or hock to the fetlock.

Canquillote—See Cheese.

Cap-bottle—See Bottle Cap.

Cap Cloths—See Cheese.

Cap Screw—A headed bolt used without a nut; a tap bolt; a threaded bolt used to secure a cap cover.

Capalase—See Cheese.

Capillarity, (Physics)—The action by which the surface of a liquid coming in contact with a solid, as in a capillary tube, is raised or depressed depending upon the relative attraction of the molecules of the liquid to each other and to those of the solid.

Capillary, (Physiology)—Very fine and hair-like. One of the microscopic blood vessels forming the capillary system, intermediate between arteries and veins. In the capillary system takes place the exchange of nutrient materials and oxygen from the blood to the tissues, and the waste products, carbon dioxide and urea, from the tissues to the blood.

Capillary Conductivity—Qualitative. The physical property relating to the readiness with which unsaturated soils transmit water.

Quantitative. The ratio of the water flow velocity to the driving force in unsaturated soil. The calculation is valid under conditions where flow velocity is proportional to driving force. For example, in practical units when the driving force is expressed in terms of the hydraulic gradient, capillary

conductivity is the ratio of flow velocity to hydraulic gradient and has the dimensions of velocity. As saturation is approached, capillary conductivity approaches the hydraulic conductivity.

Capillary Pipette—A small pipette with a minute bore or diameter which is used to deliver 0.01 ml. of milk. It is used in preparing slides for direct microscopic examination of bacteria in milk.

Capillary Water—Moisture existing in the smaller spaces between the soil particles and as films around the particles. It is free to move, but does not drain out of the soil. It is the form of water from which plants draw their supply.

Caponettes—Caponettes are birds (cockerels) that have been treated with diethylstilbestrol paste or pellets so that the effect on the bird is comparable to that of surgical castrating.

Diethylstilbestrol is one of the female hormones and the treated bird consumes more food and water shortly after the chemical is introduced. It has been found that a lower protein ration than is usually used for growing pullets for egg production is desirable for growing caponettes. Rations carrying about 15% of protein are recommended because it has been found that a higher protein ration tends to work against the effects of the chemical.

The chemical is inserted under the skin just back of the neck at the base of the comb so that the unabsorbed material will be discarded when the bird is slaughtered for marketing.

The advantages of the chemical method of castrating over the surgical method may be summarized as follows:

1. No losses because no arteries are ruptured.
2. No windpuffs as sometimes occur after surgical castrating.
3. For most persons much greater speed of operation since two persons working together can generally treat at least 200 birds per hour.
4. No slowing up of growth such as usually results after surgical castrating.

There seems to be some question about the wholesomeness of this meat and this practice is not legal in some countries.

Cappy Flavor—See Milk and Cream Defects.

Capric Acid— $C_8H_{16}COOH$. A volatile, saturated fatty acid found in butterfat to the extent of about 2.5%.

Caprin—A milk fat forming about 2% of butterfat. A combination of capric acid and glycerol.

Caproic Acid— $C_{11}H_{22}COOH$. A volatile saturated fatty acid present in butterfat to the extent of 1.5-2.0%.

Caproin—A milk fat making up a very small part of butterfat—about .36%. A combination of caproic acid and glycerol.

Caprylic Acid— $C_{11}H_{22}COOH$. A volatile saturated fatty acid present in butterfat to the extent of 10-15%.

Caramel or "Burnt Sugar"—This flavor and color is prepared by caramelizing sugar (heating until about $350^{\circ} F$). This gives the characteristic dark color and pleasant flavor known as caramel.

If only the caramel color is wanted without the flavor, the caramelized sugar can be dissolved in a small amount of water and then alcohol added. Most of the sugar will thus precipitate out and the color will be retained in the solution. This solution can then be concentrated by evaporation and the color can be added in suitable proportions to produce the light brown color generally used in caramel ice cream or as a suitable color for maple ice cream. Caramel color and flavor can be bought from most of the ice cream supply houses.

Caramel Flavor—See Milk and Cream Defects.

Caraway—A biennial or annual herb whose seed *Carum carvi* is used to flavor bread, cake, confections and cheese.

Caraway Cheese—See Cheese.

Carbohydrate—Any member of a group of neutral compounds composed of carbon, hydrogen and oxygen and consisting primarily of the sugars and their polymers. Lactose is the principal carbohydrate in milk.

Carbohydrate Equivalent—A term used in feeding standards. The energy value of a fat expressed in terms of carbohydrate value. Since a unit of fat produces 2.25 times as much energy as a unit of carbohydrate, the fat unit is equivalent in energy to 2.25 carbohydrate units. The carbohydrate equivalent of a feed then is equal to the sum of the digestible carbohydrate and the digestible fat multiplied by 2.25, thus: Digestible carbohydrate units + (digestible fat units \times 2.25) = total digestible carbohydrate units — or carbohydrate equivalent.

Carbolic Flavor—See Milk and Cream Defects.

Carbon Cycle—The transformations undergone by the chemical element carbon where by it is utilized by one organism, later liberated upon the death of the organism and returned to its original state, carbon dioxide, to be reused by another organism.

Carbon Dioxide, (Solid form, Dry Ice)— CO_2 . An oxide of carbon. At ordinary pressures and temperatures it is a colorless gas with almost no taste and odor. Carbon dioxide is always present in the air, usually forming about 4 parts in 10,000. Normal milk contains a small amount of carbon dioxide as a dissolved gas. As secreted by the cow, the content is about 20 mgms. per 100 ml, but on exposure to the air it is rapidly lost.

Carbon dioxide is used to a limited extent as a gas in refrigerating systems, while its use in solid form (dry ice) in the dairy industry is quite common. It is non-inflammable and non-poisonous but is capable of causing asphyxiation when present in large quantities in place of oxygen. It is absorbed by plants from air decomposed in the process of photosynthesis with the carbon being assimilated by the plant and most of the oxygen returned to the air.

Carbon Dioxide Poisoning (Silo)—During the first few days of the fermentation process of silage, carbon dioxide is given off. As this is a heavy gas it does not pass out if the doors are closed for some distance above the silage. Care should be taken therefore during the filling period when the machine has not been circulating air into the silo to blow off the dangerous gas. A good safety precaution is to lower a lighted lantern into the silo. If the flame is extinguished it is a danger signal. As a precaution during the filling period keep the doors open near the level of the silage or start the blower before anyone enters the silo for packing purposes.

Carbon Monoxide— CO . Deadly poisonous, tasteless, odorless gas formed by incomplete combustion of the carbon in fuel.

Carbonate of Lime—Same as Calcium carbonate ($CaCO_3$). Commonly used for correcting soil acidity.

Carbonation—To be impregnated with carbon dioxide. Milk and other liquids are often treated with carbon dioxide under pressure. In most instances it improves the taste and is often used in milk drinks.

Carbonation of Cream—A patented process for churning cream in an atmosphere of carbon dioxide in order to improve the flavor of the cream and the resulting butter. Experience has shown, however, that this process is not able to remove undesirable flavors and odors and consequently does not improve the quality of the butter.

Carbonic Acid— H_2CO_3 . A weak organic acid formed by dissolving carbon dioxide in water.

Carboy—A large glass bottle inclosed in a box, used chiefly for acids and the like.

Carburetor—An apparatus in which air is mixed with some volatile liquid for an engine. Usually gasoline and air are mixed.

Carcass Beef—Dressed beef halved or quartered.

See Beef Carcass Specifications.

Cardboard Flavor—See Milk and Cream Defects.

"Care and Management of Dairy Cows"—See Handbook Section P. 14.

Carminatives—Substances similar to stomachics. They are useful in stimulating peristaltic action, which results in expelling accumulations of gas in the digestive tract.

Carnivorous Animal—Flesh eating, as opposed to herbivorous which means eating plants.

Carob-Bean Meal—See Feeds and Feeding.

Carob (locust) Bean Gum—A product imported from Europe, it is an ingredient of stabilizers sold mainly for use in sherbets and ices. Its principal advantage in these products is that it inhibits overrun. Since it has a tendency to cause curdling of the milk proteins, its use in ice cream is limited, and heating to temperatures above 100° F. should be avoided.

Carotene (Carotin)— $C_{40}H_{56}$. A fat-soluble pigment widely distributed in nature and synthesized by plants only. Evidence points to the fact that it is the "parent substance" or "precursor" which animals transform into Vitamin A. Vitamin A is essential for animal life. The crystals of carotene vary in color from a bright yellow to a deep copper according to their thickness. Carotene, along with xanthophyll, another carotenoid, is responsible for the yellow color of milk fat. It is abundant in green pasture grass, well-cured alfalfa, soiling crops, new corn silage, carrots, sweet potatoes, leaf lettuce, etc. Its presence in milk is due to direct transfer from feed.

Carotinoids—A class of naturally occurring light yellow to deep red nitrogen free fat soluble pigments. The group includes compounds that are hydro-carbons, alcohols, aldehydes, ketones and acids. Their common central structure is a methylated 18-carbon conjugated unsaturated radical— $(C_{22}H_{34})$. Certain of the carotenoids are precursors of vitamin A.

Milk contains .1-.6 mgm. of carotinoids per liter. These pigments are dissolved in the fat.

Carpet Grass—See Feeds and Feeding.

Carrageen (Irish moss)—A sea weed (*Chondrus crispus*) growing on the coast of Massachusetts, France and Ireland from which "Irish Moss" is made. Carrageenin is the gum-like emulsifying principle.

Used as a stabilizer in the manufacture of ice cream and emulsified foods.

Carré Affiné Cheese; Carré de l'Est—See Cheese.

"Carry-out" or "Take-home" Package—See Ice Cream.

Carton Flavor—See Butter Defects.

Cartons—Containers widely used in the dairy industry particularly for ice cream, milk, butter and cheese. They are made from cardboard, saturated with paraffin wax, made in a variety of shapes, and not only simplify packing but economize in space and weight. Their sides also provide attractive media for advertising.

Cartridge System—See Brine Cartridge System.

Cartridges (Brine disks)—Metal containers or cartridges of various size and shape filled with calcium chloride brine (or, in some cases, an ordinary salt solution), permanently sealed, and completely frozen in the hardening room at a temperature of at least -10° F. They have been widely used as refrigeration in shipping ice cream. Their shape and size are determined by the type of packer they are to fit. They are used around or on top of the package of ice cream inside of insulated packers which are either of rigid construction or of the double-walled canvas type. These brine cartridges have the following advantages:

1. More convenient to handle.
2. Lighter in weight than ice and salt for a given amount of refrigeration.
3. Less messy than ice and salt.
4. No brine damage to ice cream containers.
5. Fairly inexpensive in the long run.

Carts, Feed—Feed carts are three wheeled carts (rubber tired) in which the feed is transported into the stable in front of the cows and from which the cows are fed. There is usually a separate cart for grain and for silage. The grain cart may be divided giving space for two or more feed mixtures.

Caryopsis—The fruit of grasses, the grain of wheat or corn.

Cascamite—Powdered urea resin glue. Highly water resistant, moldproof, stainfree.

Casco Casein Glue—Dry powder adhesive for all general wood gluing purposes.

Casco Flexible Cement—Liquid adhesive made from casein and latex. Designed especially for bonding dissimilar materials.

Casco Liquid Glue—Liquid casein glue. Designed for gluing labels to bottles. Ice water proof.

Casco-Resin—Liquid urea resin glue.

Cascotin Paste—Semi liquid casein label adhesives. For use on metal surfaces.

Case Combiner—A recently developed device which combines two or three lines of milk bottle cases into one outgoing line.

Case Stacker—This machine stacks the cases as they come from the bottle filler into stacks containing up to seven or eight cases.

Case Unstacker—A new machine that is just coming into use unstacks the empty cases from the trucks into a single line that feeds the bottle machine.

Casein—A group of at least three milk proteins, two of which are phosphoproteins. Casein comprises up to 3% of normal cow's milk. It occurs in milk in combination with calcium, magnesium and phosphate as complex colloidal particles. It is the chief constituent of cheese being coagulated for cheesemaking by acid or rennet. It may also be precipitated from milk by saturation with NaCl.

Casein is prepared in a nine or less pure state for industrial uses as paper sizing and in glue, paint, and plastics.

Casein, Acid (free casein)—Casein exists in milk as a colloidal suspension. Calcium and tricalcium phosphate are associated with the protein molecule. Casein precipitated near the iso-electric point by acid results in the removal of most of the calcium and phosphorus. This term distinguishes between calcium and phosphorus free casein, and

the more complex parent substance existing in milk and the casein formed by the action of rennet which still contains a large portion of the calcium and phosphorus.

α Casein—A protein of the casein fraction of milk. It is characterized by a phosphorus content of about 1.60%. α Casein constitutes about 75% of casein.

β Casein—A protein of the casein fraction of milk. It is characterized by a phosphorus content of about 0.67%. Casein contains about 22% β Casein.

γ Casein—A protein of the casein fraction of milk. It is characterized by its solubility in 50% aqueous alcohol and by its freedom from phosphorus. It constitutes 3.4% of casein.

Casein, Dried—A commercial casein product usually obtained from skim milk by dilute sulfuric acid precipitation. The curd is washed, drained, placed in trays and dried in a heated chamber. When the moisture has been reduced to 2.5%, the curd is ground fine. It is then packed and shipped to be refined and made into glue, paints, plastics, etc.

Casein/fat Ratio—See Cheese.

Casein Formalin Spray Method—A method for the treatment of butter boxes to overcome wood taint. It consists of applying an emulsion of 4 parts casein, 7.5 parts borax and 500 parts of water on the interior of the container, then spraying this coating with a solution of formalin (100 cc water to 100 cc 40% formaldehyde).

Casein-gel—See Sodium Caseinate.

Casein Lactate—A chemical compound formed by the action of lactic acid on the casein of milk. Recent research shows that the casein is precipitated as mono calcium caseinate and as base free or uncombined casein. A common belief was that in the natural souring of milk the lactic acid formed by microorganisms dissolved the calcium from the calcium caseinate and replaced it forming casein lactate.

Casein Number—The ratio of the casein nitrogen to the total nitrogen in milk. This index has been suggested as a method of diagnosis of mastitis.

Casein Plastic—A hard ivory like product made from the casein of milk. Properties: resists the action of water, takes colors readily, odorless, nonflammable, easily cut into desired shapes and sizes. Casein plastic is used as a substitute for celluloid, horn,

and tortoise shell. Combs, buttons, rims for eye-glasses, fountain pen barrels, electrical insulations, billiard balls, etc. are made from it. This material also is rapidly assuming importance in the building field. Essentially it is formed by mixing and condensing casein with formaldehyde.

Casein-Seedmeal Blend Glues—Low cost dry adhesives for industrial wood gluing. Made from casein and processed oil seedmeals.

Caseinate—A salt of casein.

Caseins and Caseinates, Edible—Refined products of an edible grade for food and pharmaceutical manufacture. Include calcium caseinate and sodium caseinate.

Caseins and Caseinates, Protoac—A group of modified casein products especially designed for laboratory and industrial use. They are used in the cosmetic, leather, paint, paper, pharmaceutical, printing, rubber, textile, wine, wax and other industries.

Cash-and-carry Price—This term refers to the lower price at which milk and other goods usually can be bought in stores which do not maintain credit and delivery systems and therefore may have less over-head expense. The customer pays cash for his purchase and carries it away himself.

Cash Crop—See Crop, cash.

Casigolo—See Cheese

Casing, (In cheesemaking)—See Cheese.

Casing Machine for bottles and cartons handles automatically what was formerly done by hand.

Cassava Meal—See Feeds and Feeding.

Castello Branco Cheese; Castelmagno; Castle Cheese—See Cheese.

Castrate—Make barren; to remove the testicles or make useless; to remove the ovaries, generally termed to spay. In the male to improve fattening qualities. In the female to prevent conception.

Castrator—One who castrates.

Catalase—A secreted enzyme found in milk in small but varying quantities; also of bacterial origin. It decomposes H_2O_2 with the liberation of O_2 . Separator slime contains the largest proportion of catalase; cream contains more than milk, and butter has but a very small proportion. It is precipitated in the casein when milk is coagulated. It is readily destroyed by heating to 65-70° C. (149-158° F.) for 30 minutes. This fact is made use of in testing for heated milk, or for mastitis milk.

Catalyst or Catalytic Agent—In chemistry, a substance which by its mere presence alters the velocity of a chemical reaction, and may be recovered unaltered in nature or amount at the end of the reaction.

Cataphoresis—The motion of charged suspended particles in an electric field. The particles "wander" to that electrode which has an electric sign opposite to that on the particles. Synonymous terms are: electrocataphoresis and electro-phoresis.

Catch Crop—See Feeds and Feeding.

Caterpillar Tractor—A trade-mark for a tractor that travels upon two endless metal belts, one on each side of the machine, kept in motion by toothed driving wheels so that the tractor moves forward with the revolution of the belts; especially for use on very rough or wet ground.

Cat-hammed—Thru and flat from side to side of the thigh, with an incurving of the rear line; said especially of dairy cattle, in which the udder then stands out prominently behind the thigh.

Cation (Chemistry)—In an electrolyzed solution the positively charged ion or particle which travels to the cathode (negative pole) and there is discharged or deposited or evolved.

Cation Exchange—The interchange between cation in solution and another cation on the surface of a colloidal or other surface active material. Cation exchange capacity is the sum total of exchangeable cations adsorbed by an active material. This capacity is expressed quantitatively as milliequivalents per 100 grams of active material.

Cattabu—A hybrid between domestic cattle and the Zebu, or Indian humped Brahman cattle.

Cat-Tail Millet—See Feeds and Feeding.

Cattalo—A hybrid produced by breeding a domestic animal of the ox kind with an American Buffalo or bison.

Cattle—A collection of live domestic animals kept as property or for use by an individual; especially bovine animals such as cows, bulls, steers, etc. Formerly applied to all kinds of animals so kept.

Cattle Dog—A dog used for tending cattle.

Cattle Leader—A nose ring for cattle. One who leads cattle.

Cattle Louse—A louse that attacks cattle. Commonly there is one species of biting louse which lives on hair and skin particles and three species of sucking lice which suck blood and are called blue lice.

Cattle man—A man who tends or raises cattle.

Cattle Plague—See Diseases in Cattle.

Cattle-tick—A tick infesting cattle in southern United States, believed to be the chief means of transmitting the parasite causing Texas fever.

Caudal Supernumeraries—Supernumerary teats usually found in the rear of the normal teats of a cow.

Caustic Potash—See Potassium Hydroxide.

Caustic Soda—See Sodium Hydroxide.

Cavitation—See Milk, Processing and Processing Equipment.

Caypm (Borden's)—Dry vitamin supplement for calf meals. Contains vitamin A and D, and the complete B-C group.

Cay—A stray animal as a cow, steer, horse, or a group of strays.

Cay-Cay Butter—See Dika Butter.

Cayuse—An Indian pony.

Cell—A minute, usually microscopic living organism consisting essentially of a nucleus enclosed in a mass of cytoplasm. It may be an independent unit of life like protozoa or bacteria, or it may exist as a structural unit of more highly complex plants or animals. In these higher forms the cells are differentiated to perform distinct functions.

Animal cells usually secrete a nitrogenous cell wall, plant cells may develop a cellulose wall. Some cells, however, may exist as naked protoplasts. Some cells are motile while others are stationary. All have the power of reproduction, each cell arising by division of a previously existing cell. Thus every cell in the body of a plant or animal has developed from the original egg cell.

Cellular Test for Pasteurized Milk—See Dairy Tests.

Cellulose—A chemically complex carbohydrate substance ($C_6H_{10}O_5$)_n making up most of the structural parts of a plant such as the cell walls. It is more insoluble and less digestible than most of the carbohydrates.

Cement—Any natural or manufactured material which causes adhesion to two surfaces causing them to combine particles into a whole. The main three classes of cement are:

1. Building cement which includes lime, the hydraulic cements and gypsum plasters.
2. Plumber's cements made with asphalt, tar and pitch.
3. Adhesives including a wide variety of mixtures such as glue, rubber cement, putty and pipejoint cement.

Center of Gravity—That point in a body about which all parts exactly balance each other.

Centring Day—In Dairy Herd Improvement Work, the middle day of the testing period.

Centimetre 0.3937 inches. See Table of Weights and Measures in Reference section.

C. G. S.—In Physics this is an abbreviation commonly used to indicate centimeter-gram-second.

Centipoise—One hundredth of a poise. Viscosities are frequently expressed in centipoises. It is one hundredth of that force which when exerted on unit area between 2 parallel planes 1 cm. square and placed 1 cm. apart would produce a difference in velocity of streaming of the 2 planes of 1 cm. per second.

Central Control Panel—A compact system for electrically and automatically controlling all pasteurizing temperatures in a milk plant. All operations are controlled from a panel switcher for starting and stopping the entire unit being within easy reach of the supervisor. The panel is nothing more than a board containing such equipment as recording thermometers, motor operated steam valves, electric clock, holder switches, lights, milk pump and water pump switches.

Centralized Creamery Butter—See Butter.

Centralizer—A word commonly used to describe a large creamery located in some central railroad or trucking center where farm separated cream for manufacturing butter can be assembled from a large territory.

Centrifugal Force—When a body revolves in a curved path, it exerts centrifugal force upon the arm, cord or surface which restrains it from moving in a straight line. This force in pounds is equal to the weight of the body in pounds multiplied by the square of the velocity in feet per second, divided by 32.16 times the radius of the circle in feet in which the body revolves.

Centrifugal Separation—See Milk. Separators.

Centrifuge—See Milk, Separators.

Centripetal force—The force required to keep a moving mass in a circular path.

Centrosome—A minute round body usually found near the nucleus in the cytoplasm of the cells of many animals and some plants. It plays an important part in cell division, in that it seems to be the attraction point where cell division starts.

Cephalins—A group of phospholipides each molecule of which consists of 1 molecule of glycerol esterified with two molecules of fatty acids, one molecule of phosphoric acid and one molecule of either ethanalamine or serine. Cephalins are present in small concentrations in milk.

Cereal—See Feeds and Feeding.

Cereal Cream—See Milk, Cream.

Cereal Milk—See Cereal Cream.

Cereal Flays—See Feeds and Feeding.

Cerebrosides—A class of nitrogenous lipides each molecule of which consists of one molecule of sphingosine esterified with one molecule of fatty acid and one molecule of galactose. They occur in small amounts in milk.

Cerelose—Trade name for glucose or corn sugar.

See Glucose.

Ceres—See Feeds and Feeding.

Cerophyl—A patented preparation in concentrated form ($\frac{1}{2}$ gram tablet—4.4 oz.) made from selected young wheat, oats, barley, and rye grasses, dried and tableted. It is a natural food supplement. The vitamin content per 10 grams (20 tablets) is as follows: A (Carotene), 7000 I.U.; B₁ (Thiamin), .09 mg.; C (Ascorbic acid), 35 mg.; G (Riboflavin), .25 mg.; K 1.5 mg.

Grass juice factor rich source.

Chlorophyl (a non-vitamin factor) 75 mg. per 10 grams.

A source of the entire B complex.

Certified Area, (Bangs)—An area free from Bangs disease for two years.

Certified Area, (Modified)—An area in which the number of brucellosis reactors (exclusive of officially calf vaccinated animals under 30 months of age) does not exceed one per cent of the cattle, and the herds infected do not exceed five per cent of all herds.

See Accredited Areas.

Certified Dyes—Coal tar dyes which have been approved and certified as to lot purity by the Bureau of Chemistry of the U.S.D.A., for coloring ice cream and other foods.

Certified Herd, (Bangs)—A herd that is free from Bangs disease with 2 negative tests in a year.

Certified Milk; Certified Milk-Pasteurized; Certified Raw Milk—See Milk.

Certified Seed—Seed which is guaranteed by certain agencies to meet specified standards of germination, purity, variety and freedom from disease.

Certora (Borden's)—Roller process nonfat dry milk solids for bakers, confectioners, prepared-flour manufacturers.

Cervicitis—See Diseases in Cattle.

Cervix—The neck or lower end of the uterus leading into the vagina.

Cesspool, Septic Tank—Underground tank at the end of a drain to collect sedimentary or refuse matter; especially a receptacle for collecting refuse from sinks and bathrooms of a house.

A processing plant should have proper filtration beds connected with its cesspool.

Chaff—The glumes or husks of grains and grasses usually separated from the seed by threshing machines.

Chain Gear—A gear chain so arranged that motion is transmitted by means of a chain which runs in a special groove or engages the cogs of a sprocket wheel.

Chain Reactions—A sequence of reactions each of which is dependent on the previous action as applied to reflex actions in biology or chemical reactions.

Chalone—Anti-hormone. An autacoid which has an inhibitory or depressing effect on the metabolic processes of an animal, rather than a stimulating effect. See Hormone.

Champion—Anything awarded first prize or place in competition; in livestock, more properly, the winner among the animals placed first in their respective classes based on sex and age.

Champoleon, Queyras—See Cheese.

Channel Island Breeds—Breeds of cattle known as the Jersey breed and the Guernsey breed developed in the Channel Islands. The cattle were formerly classed together and called Alderney after the island third in size in the group. Jersey Island is the largest and Guernsey Island is second in size. These breeds are well known in the United States. The Channel Islands lie in the entrance to the English Channel about nine miles from the coast of France and about seventy miles from England. They belong to England.

Chantelle Cheese—See Cheese

Chanurce—See Cheese

Chaparras—Overalls of sheepskin or leather usually open at the back worn especially by cowboys often called chaps.

Character—One of the many details of form, structure, substance or function which taken collectively constitute the individual peculiarity possessed by an individual by means of which it may be recognized or differentiated.

Charqui (Jerked Beef)—Beef or other meat cut in long strips and dried in the wind and sun.

Chaschol, Chaschosis—See Cheese

Chasmophytes—Plants usually found in rock crevices.

Chateau Brand—See Cheese

Chattel—A term generally applied to movable or immovable property with the exception of real estate.

Check Testing—See Cheese

Checks in Cheese—See Cheese Defects (Swiss)

Cheddar Cheese—See Cheese

Cheddar Cheese Flavor—See Butter Defects

Cheddar Cheese (Standards)—See Cheese

Cheddar (Common Names of)—See Cheese

Cheddaring (Matting)—See Cheese

C H E E S E

A concentrated dairy food product made from the coagulated portion (curd) of milk, cream, skim milk, whey or buttermilk and consisting chiefly of casein, fat and moisture. Milk is coagulated either by the addition of rennet or by the lactic acid produced by the addition of starter. A portion of the

water is removed by cooking, stirring or draining the curd or by the application of pressure. The cheese may or may not be ripened, the ripening period varying from a few days to many months depending upon the type of cheese.

Cheese is the sound, solid and ripened product of milk and cream made by coagulating the casein thereof with rennet or lactic acid with or without the addition of ripening ferments and seasoning and contains in the water-free substance not less than 50% of milk fat.

Cheese: A Brief History Of—See Handbook P. 150

CHEESE—NAMES AND DESCRIPTIONS

Abertam—A hard rennet cheese made from sheep's milk in the region around Carlsbad, Bohemia.

Acidophilus—See Yoghurt and Acidophilus Cheese

Aged—Cheese which is fully ripened or cured and has a pronounced typical flavor and well broken down body.

Alemtejo—Cylindrical shaped soft cheese made in the province of Alemtejo, Portugal. It is made in three sizes: 1 lb., 2 lb. and 4 lb. For the most part, sheep's milk is used although goat's milk is often added. It is ripened for several weeks.

Allgauer Rundkase or Allgäuer Emmentaler—A Swiss type cheese made in southern Bavaria from $\frac{3}{4}$ " thick and weighing 10-17 lb.

Alpin—A kind of Mont d'or cheese made in the Alpine regions of France. It is also known as Clérimbart and ripens for 8 to 15 days.

Altenburger—A goat's milk cheese made in Germany where it is called Altenburger Ziegenkase. It is about 8 inches in diameter, 1 or 2 inches thick and weighs about 2 lb.

Ambert—A cylinder-shaped Roquefort type cheese of southeastern France made from cow's milk. Salt is mixed with the curd rather than rubbed on the surface of the cheese.

American—See Cheddar

American or American Type—Include Cheddar, Colby, Cranular, Stirred Curd or Soaked curd. See Cheddar.

American Style Brick—See Daisy Brick and Brick Flats.

American Swiss—See Swiss Cheese.

Ancien Imperial—A cheese, the curd for which is prepared and cured the same as Neufchâtel.

It is also known as Petit Carré, and when ripe, as Carré Affiné.

Appenzeller—A cheese very similar to Emmentaler made of cow's milk (skim or whole) in the Canton of Appenzell, Switzerland, and also in Bavaria.

Appetitost—A Danish sour Buttermilk cheese.

Armavir—A cheese made in the western Caucasus from sheep's whole milk, similar to Hand cheese.

Arnauten—Same as Travnik.

Asadero, Oaxaca—A white whole milk Mexican cheese. The curd is heated and the hot curd is cut or braided into 8 oz. to 11 lb. sizes.

Asiago (originated in Italy)—A grating cheese of the Grana type weighing 16-22 lb. The cheese may be eaten fresh, medium aged or well aged, resembling Fontina, Parmesan and Romano respectively.

Asin, (Water)—A sour-milk, washed curd, soft buttery cheese of 8 inches diameter and weighing 14 lb., made in northern Italy. A white mold becomes visible on the surface in 10-15 days and the rind gradually turns pale yellow. This mild cheese is ready to eat in 1-2 months.

Backsteiner, (meaning Brick)—A cheese similar in shape to a brick; of Limburger-like character, made in northern Germany.

Bagozzo or Grana Bagozzo—A Parmesan-type cheese similar to Reggiano and Parmigiano. The red coated cheese has a hard yellow body and a sharp flavor.

Baker's—A type of cottage cheese made from skim milk which has been coagulated by the addition of starter and rennet. After coagulation the curd is dipped from the vat with curd pails and placed in cotton draining bags which are piled or hung on racks until the curd assumes a pasty condition. The excess whey is pressed out if necessary, and the curd is then salted lightly and packed for distribution.

Banbury—A soft, rich cheese popular in England in the early 19th century. It is a cylindrically shaped cheese about an inch thick.

Barbery—A soft rennet cheese similar to Camembert, and deriving its name from the village of Barbery, near Troyes, France. In summer it is often sold without ripening. It is about 5 or 6 inches in diameter and 1¼ inches thick.

Battlemat—An Emmentaler type cheese made in the Canton of Tessin, Switzerland, western Austria, and northern Italy. It is circular in form, about 16 inches in diameter, 4 inches high, and weighs from 40 to 80 lb. It ripens faster than Emmentaler, being ready for market in about 4 months.

Bauden—A sour milk cheese made in herders' huts in the Bohemian and Silesian mountains. Locally it is known as Koppen. It is made in two forms, one conical with a diameter and a height of 3½ inches, and the other cylindrical with a diameter of 5 inches and a height of 2½ inches.

Belgian Cooked—The skim milk is curdled and the curd is heated to 140° F., placed in a cloth, and allowed to drain. When dry it is thoroughly kneaded and allowed to ferment. This takes from 6-8 days in summer and 10-14 in winter. When the fermentation is complete, salt and cream are added, and the mixture is slowly heated and stirred until it is homogeneous. It is then put into molds and allowed to ripen 8 days. Weight is about 3½ lb. per cheese.

See Cooked Cheese (Kochkase).

Bellelay, Tête de Moine, (Monk's Head)—A soft rennet cheese made from sweet, whole milk and sometimes called Monk's Head or Tête de Moine. It originated with the monks in the Canton of Bern, Switzerland, and is found there now. The milk is set at 90° F. with rennet enough to coagulate it in 20-30 minutes. The curd is cut rather fine and is stirred while being heated slowly to a temperature of 110° F., being cooked much firmer than Limburger cheese but not so firm as Emmentaler. When cooked the curd is dipped into wooden hoops lined with cloth. After being pressed, the cheeses are wrapped in bark for two weeks and are cured in a cool, moist cellar, as eyes should not develop. It takes about a year to ripen and will keep for 3 to 4 years. It is 7 inches in diameter and weighs 9 to 15 lb. It is soft and buttery and may be used as a spread.

Bel Paese—A popular uncooked soft, sweet, fast-ripened Italian table cheese. 0.25% starter is added to milk at 104-110° F. Rennet is added and the coagulated curd is cut in ¾" cubes. After firming, the whey is removed and the cheese is placed in hoops.

After 5-7 hours draining the curd is placed in a salt brine. A surface growth develops in the curing room and the cheeses are washed 2 or 3 times with a dilute salt brine. After 3 weeks curing the cheeses are wrapped or paraffined and marketed.

Bergkase—The name applied to Alpine cheese of the Swiss type. This may include Battlematt, Piora, Gruyere, Fontina, Wallser and Vachern.

Bergquara—A Swedish cheese resembling Gouda. It was known in Sweden as early as the 18th century.

Bernarde—An Italian cheese mainly from cows' milk which is colored with saffron. The cheese is dry, salted and is cured 2 months.

Bug Panir, (Daralag)—An Armenian cheese from sheep's milk, partly or entirely skimmed. Rennet is used to coagulate the milk, the curd drained after which it is broken up and salt and herbs added. After being pressed again the cheese is put into a salt bath for at least two days.

Butto—A cheese of the Emmentaler group that is made in Italy. It may be eaten fresh or ripened for as long as 2 years; at which time it is very hard and has small eyes.

Bleu, Fromage bleu, (in U.S.A. Blue)—A Roquefort type cheese (blue-veined) made out of the Roquefort area. Also called Laguiole, Gex, Mont Cenis, Sassenage and Septmoncel.

Blind—A cheese that has no "eyes" or gas holes.

See Swiss—defects.

Block Swiss—Oblong or square in shape from 20-25" long, 6-8" square and weighing 25-36 lb.

Blue Mold—A term often used for Roquefort or Roquefort-type cheese, especially that made in the United States. A cheese made outside the Roquefort area of France with *Penicillium roqueforti*.

Blue veined—Blue Stilton, Roquefort, Gorgonzola.

Blue, (Standards)—(Federal Register Vol. 15, 164-19.0) Maximum moisture, 46%. Minimum fat, 50% in the dry matter.

Body—A term applied to a natural cheese which imparts the desired characteristics to process cheese.

Bondon—Same as Neufchâtel cheese but having a slightly different shape.

Bondost—A Swedish type farm cheese of a cylindrical shape weighing 2½-3 lb. It may be flavored with cumin or caraway and is cured for 6-8 weeks.

Borella—An Italian buffalo milk cheese.

Boudanne—A French cheese made from cows' milk, either whole or skim. The milk is heated to about 85°F., enough rennet added to coagulate it in an hour and the curd cut to the size of peas, stirred and heated to at least 100°F. After standing 10 to 15 minutes the curd is pressed by hand into molds 8 inches in diameter and 3 inches high. They are drained, turned often and ripened about 3 months.

Bourgain—See Neufchâtel.

Box, (Firm)—A German cheese made from cows' milk. It greatly resembles Brick cheese and weighs from 1 to 4 lb. The soft cheese is sometimes called Hobenburg, Mondsee or Weihenstephan according to the name of the district in which it is made.

Box, (Soft)—A partly skimmed milk cheese called Hohenheimer or Schachtelkase in Germany. The curd is mixed with caraway and cured for three months.

Bra—A cheese made first by the Nomads in the region of Bra in Piedmont, Italy. It is a hard rennet cheese about 12 inches in diameter, 3 inches high and weighs about 12 lb.

Brand—A German hand cheese weighing about ½ of a pound, made from sour milk curd that is cooked at a slightly higher temperature than is usual. The curd is salted and allowed to ferment one day. Then it is mixed with butter, pressed into shape, dried and placed in kegs to ripen during which time it is occasionally moistened with beer.

Branza de Braila—See Cheese, Teleme.

Breakfast—See Fruustuck Cheese.

Brick—A soft, smear ripened, high moisture cheese which was developed in America and is largely made in Wisconsin. The body is softer than Cheddar and has a flavor between Cheddar and Limburger. It derives its name from the fact that it is made in bricks about 10" x 6" x 3".

Brick, (Standards)—(Federal Register Vol. 15, 164-19.0) Maximum moisture, 44%. Minimum fat, 50% of the dry matter.

Brick, (Average Composition of)—Water 42.50%, Fat 30.70%, Protein 21.00%.

Brick Flats—A brick cheese $13\frac{1}{2}$ " in diameter, 6" high and weighing 32-37 lb.

Brickbat—A rennet cheese made in Wiltshire, England as early as 1700. It is made from fresh milk to which a small amount of cream has been added. It is said to be fit for consumption one year after being made.

Brie—A soft cheese, closely resembling Camembert cheese, surface-ripened by molds and bacteria. It is highly flavored, and is ripened from 3 to 5 weeks. It originated in the countryside around Paris.

Brioler—A limburgier type cheese of East Prussia.

Brinsen, (Liptau)—A sheep or goat's milk cheese of Hungary. The curd is placed on a curing rack for 8 days until a smear is developed. It is salted and packed with beech shavings.

Buttermilk—A cottage cheese made from raw, sour cream buttermilk, or from sweet cream buttermilk to which a starter has been added. It may also be made from sour, pasteurized cream buttermilk, in which case the curd formed is chalky and must be recovered from the whey by means of a centrifuge; or the curd may be recovered by first dissolving with 1½ the fine curds formed by pasteurization, and then precipitating the curd again with hydrochloric acid. The flavor may be sharp and acid.

Caciocavallo—A hard, rennet-curd, bacteria-ripened Italian cheese. It is ripened several months and is characterized by a hard sharp flavor. It is molded in the form of a ten-pin. A pasta filata type identical to Provolone, except for the shape, a slightly lower fat content, and the fact that it is not smoked.

Caciocavallo Siciliano—A pasta filata cheese like the Italian Provolone and Caciocavallo, essentially a pressed Provolone. It is used as a table cheese and for grating.

Cacio—Same as Chivari Cheese.

Cacio Fiore, (Caciotta)—A soft yellowish cheese with a delicate buttery flavor similar to Bel Paese. The whole milk is colored with saffron and coagulated with a vegetable rennet (artichoke family). It is cut, drained on straw mats and is cured for 10 days.

Cacio Romano—Same as Chiavari Cheese.

Caerphilly—A semi-hard cheese, made by the cheesemakers in Wales.

Calcagno—A hard pecorino type cheese of Sicily suitable for grating.

Cambridge, (York)—the most important English soft cheese, which originated around the Isle of Ely. It is made only in the summer. The one lb. cheeses are consumed fresh.

Camembert—A soft rennet cheese of French origin made from cows' milk testing 3.5% fat or less. After setting and draining, the cheese is salted and mold-ripened at 53° to 59° F. in a room with a high humidity. The ripening period is generally 4 to 6 weeks. The interior is yellow and waxy or creamy. The mold used is *Penicillium camemberti*.

Camembert, (Composition of)—

	Water %	Protein %	Fat %
Maximum	54.41	21.08	32.13
Minimum	43.08	16.83	23.04
Average	47.91	19.66	27.33

Camosum—A semi-soft open-textured cheese resembling Gouda and Monterey.
See Stirred Curd.

Canned—Cheese which is melted down in a steam heated hopper under agitation and filled into clean, dry cans which are lined with parchment liners. The cans are sealed and processed in retorts, cooled, and packed in cases.

Green cheddar cheese which is cured in cans or glass and sold as such. Some of these cans have one-way gas valves which permit the escape of gas formed in the cans during aging, but prevent air from entering. These valve vented cans are not used extensively because of cost.

Canquillote—A skim milk cheese made in France and eaten fresh.

Cantal, (Fourme)—A yellow, piquant close-bodied cheese of France.

Caraway—A spiced cheese containing caraway seeds.

Carre Affine—See Ancien Imperial Cheese.

Carre de l'Est—A Camembert-type cheese made in France.

Casigiolo—A Caciocavallo-type cheese of Sardinia.

Castello Branco—See Cheese, Serra da Estrela.

Castelmagno—A blue mold Gorgonzola type cheese of Italy

Castle—See Schloss Cheese

Champoleon Queyras—A hard Canquillote skim milk cheese of France

Chantelle—The trade name of a semi-soft smear ripened cheese coated with red wax. It is made and cured like Bel Paese but it resembles a Trappist cheese in body and texture

Chaource—A Camembert type cheese of France

Chaschol, (Chaschosu)—A hard skim milk cheese of Switzerland

Chateau Brand, (Borden's)—Process cheese food made from blended mild and aged cheddar

Cheddar, (American Cheese)—This cheese is named after the village of Cheddar in Somersetshire England where it was first made. Colonial housewives made the first Cheddar cheese in America and the first Cheddar cheese factory was established by Jesse Williams near Rome, Oneida County, N. Y. in 1841. At present 75% of all cheese made in the United States is Cheddar.

This hard, rennet cheese ranging in color from white to orange is usually made from pasteurized whole milk. The milk is cooled to the setting temperature 86-88° F run into the cheese vat and starter (lactic acid bacteria) added and milk stirred as it ripens for approximately an hour. Rennet and color are added and stirring is stopped. The curd sets in about 30 minutes and is then cut with curd knives into very small cubes to allow the whey to drain off. The stirring process is continued either by hand or by use of curd rakes until the whey is drained. Then the curd is heated gradually to about 100° F and maintained until the curd is ready to be removed from the whey. When the desired firmness of the curd and degree of acidity of the whey is reached the whey is drained (dipping process) from the vat.

When the curd is firm enough to be turned without breaking it is cheddared, i.e. matted and piled and cut into strips. Next, the curd is run into a curd mill and spread evenly over the bottom of the vat and stirred. Salt is added and curd is piled at either side of the vat to allow whey to drain. After the salt has completely dissolved the curd is removed to cloth lined metal hoops and pressed. When the pressing process is completed the curd is dried for 3-4 days at a temperature of 60-65° F., then dipped in

paraffin or cheese wax and boxed for shipment to be cured. Curing temperatures range usually from 40-50° F., sometimes as low as 35° F and as high as 50° F. Curing time usually is 3-6 months, may vary to a year. 100 lb of milk makes a 9½-lb cheese.

See A Simplified Short Time Method for Making Cheddar Cheese From Pasteurized Milk in Handbook P 160

Cheddar Cheese, (Standards)—(Federal Register Vol 15, 165, 1950) Maximum moisture 39%. Minimum fat 50% in the dry matter. Nomenclature of U. S. Grades: (a) U. S. Grade AA, (b) U. S. Grade A, (c) U. S. Grade B, (d) U. S. Grade C.

Cheddar, (Average Composition of)—Water 36%, Fat 31.5%, Protein 21%. Cheddar cheese in the U. S. is known under many names such as American, Danes Twin, Young America Flats Triplets.

Cheddar, (Common names of)—Courtess E. C. Darnow Bros.

Name	Wt. of Cheese in lb	Size of Cheese in inches	(1)
Longhorn	12	6 x 13	15½
Favorite or ¼ Young American	5½	7 x 3½	5½
Young American	10	7 x 7	8½
Penic	10½	9½ x 4	6
Daisy	22	13½ x 4½	6-18
Twin	32	14½ x 5½	6
Cheddar Skim milk	22	13½ x 11½	13
½ Longhorn	27	10 x 9	12½
10 lb square print	10	14 x 6½	6½
Triplet	22	14 x 23	47½
Midjet	11	9½ x 5	6½
Gem	21½	14 x 5½	5½
20 lb Square Wilson Style	20	14½ x 13½ x 5½	23½

(1) Height of Hoop less Bandages (in inches)

Cheese Food, (Pasteurized Process)—A food prepared by mixing with the aid of heat one or more of the following: cheese, part skim cheese, an emulsifying agent, an acidifying agent, water, salt, coloring, spices or flavoring. Other optional ingredients are cream, milk, skim milk, cheese whey, or a mixture of two or more of these, or any of the foregoing from which part of the water has been removed and albumin from cheese whey. The moisture content of this product is not more than 41% and the fat content is not less than 23%. The product must be pasteurized for not less than 30 seconds at 150° F. For more detailed information see U. S. Cheese Standards.

Cheese, (Mammoth)—A large Cheddar cheese usually over 100 lb.

Cheese, (Natural)—Natural Cheese is that made directly from milk or whey, as opposed to processed cheese which is usually made from a blend or combination of several kinds of natural or hard cheese.

It is made by coagulating or curdling milk, heating and stirring the curd and eventually draining off the whey and accumulating and pressing the curd. Flavors and texture desired are usually obtained by curing the cheese during the holding period at specific temperatures and humidity.

Cheese Spreads—Whittier and Webb say: "Cheese spreads are food products, usually of a buttery consistency, which contain cheese and other ingredients such as milk or whey solids, emulsifying agents, relishes, seasonings, condiments and coloring matter. The difference between spreads and processed and pasteurized cheese is that the spreads are softer and may contain substances other than cheese and emulsifying agents. Because the manufacturing processes are similar, cheese spreads may be considered as modified processed cheeses."

There are three principal types of spreads on the market: (a) cream cheese with pickles, pimientos, olives, etc.; (b) processed cheese of sufficient moisture content to be buttery in consistency; (c) processed cheese to which concentrated whey or skim milk has been added, and which contains sufficient moisture and fat so that it spreads easily.

Cheddar, Swiss, Roquefort and Neufchatel are the varieties of cheese used principally in cheese spreads, but most other varieties may be used. Condensed and dried whey and skim milk are produced for use in cheese spreads.

Federal Regulations now specify minimum amount of butterfat and maximum amount of water that they may contain.

Cheese Spreads, (Borden's)—Pasteurized process cheese spreads.

Cheese Spread, (Pasteurized)—Pasteurized cheese spread conforms to the standards of identity of pasteurized process cheese spread except that no emulsifying agent may be used.

Cheese Spread, (Pasteurized Process with fruits, vegetables or meats)—Pasteurized Process Cheese Spread with fruits, vegetables or meat conforms to the definitions and standards of identity of pasteurized process cheese spread except that it contains a mixture of one or more of the following: cooked, canned or dried fruit; cooked, canned or dried vegetables; cooked or canned meat.

Cheese, (Uncolored)—Cheese to which no coloring has been added. It may be very pale straw or cream white in color. It can range from a low to high degree of yellow depending on fat content and season of year.

Cheshire—A hard, rennet cheese first made in England, from sweet whole cows' milk. The cheese is very highly colored, cylindrical in shape, from 14 to 16 inches in diameter, and weighs from 50 to 70 lb. It is one of the oldest and most popular of the English varieties of cheese. It is crumbly or flaky in body and mild in flavor.

Cheshire-Stilton—A combination of the characteristics of Cheshire and Stilton varieties. The making procedure, size and shape are similar to Cheshire but the mold of Stilton is used.

Chhana—A sour skim milk cheese of Asia.

Chiavari—A sour milk cheese of Chiavari, Italy.

Christalonna—A hard, rennet cheese made from cows' milk in the Canton of Grisons, Switzerland.

Christian IX—A Danish cheese differing from Kuminost in size and shape.

Clérimbart—See Alpin Cheese.

Close Texture—Cheese which is firm and compact in structure with practically no openings in the body of the cheese.

Club—A variety of cheese made from well ripened American cheddar by grinding to a smooth paste and mixing in a certain amount of butter, with or without other flavoring materials. It is often flavored with pepper, and when colored green and having a peppery taste it is called Chili cheese. Formerly known as Potted cheese.

Colby—Similar to Cheddar; made from either raw or pasteurized milk. The curd is not matted and milled, but water at about 60° F. is added to cool the curd to 80° F. after it has been cut, stirred and heated and part of the whey drained off. Stirring is continued as water is added and for 10 to 20 minutes longer. Then the curd is drained and stirred to prevent matting, salted and placed in hoops and pressed. Colby is softer and more open than Cheddar, has more moisture and does not keep as well.

Colby, (Standards)—(Federal Register Vol. 15, 164—1950) Maximum moisture 40%; Minimum fat 50% of the dry matter.

Cold-cured—Cheese cured at temperatures of 32-40° F. Such cheese requires longer ripening time (3-12 months), is milder and more uniform in flavor than cheese cured at higher temperatures.

Cold pack Cheese Food—Similar to a cold pack cheese except that cream milk, skim milk and cheese whey may be used. See Definitions and Standards of the Food and Drug Administration.

Cold pack, Club, Comminuted—A food prepared without heat by comminuting one or more cheeses of the same variety or different varieties except cottage cream, part skim, and skim milk cheese.

The moisture content of the cold pack cheese must not be greater than the maximum for a single variety if only one variety is used. The moisture for a cold pack cheese is not more than the arithmetical average of the varieties if two or more varieties are used. If the cold pack is made from 2 or more varieties the fat content is not less than the arithmetical average as defined. The cold pack cheese may be smoked or flavored with smoke. Acids, water, salt, coloring and flavoring may be used.

See Definitions and Standards of the Food and Drug Administration.

Cold pack Cream—Reference to the treatment of a cook-cured cream cheese, in contrast with a hot pack method in which the curd, after draining, is placed while cold into containers.

Comminuted—See Cold Pack Cheese.

Commision—Cheese made in Holland in much the same manner and shape as Edam cheese, from slightly skimmed milk. Each cheese weighs about 8 lb.

Comté—A Gruyère type cheese of Eastern France.

Cooked, (German Kochkäse)—A variety of cheese made by breaking up and heating the curd of sour milk. After cooling the curd, it is allowed to stand for 3-4 days, after which time it is heated over a fire until it develops the consistency of thick molasses. The cheese is then put into molds. Also known as Pennsylvania pot cheese.

Coon—A cheddar cheese, originally produced in northern New York State, shell cured and coated with black wax. Cheese of 36% moisture is cured at 65-70° F. and

85-90% relative humidity whereas cheese with a moisture content of 40% is cured at 55-60° F. and 75-80% relative humidity.

See U. S. patent 1,579,196.

Cornhusker—A Colby type cheese introduced by Nebraska Ext. Station. It has numerous mechanical openings, a higher moisture content, and a more rapid making procedure than Colby.

Cotterstone—A rennet cows milk cheese made in Yorkshire, England. It resembles Sulton cheese. It is chiefly a local product manufactured on a small scale. It is also known as Yorkshire Stilton.

Cotrone—A ewes milk cheese similar to Moliterno of Calabria and Lurania, Italy.

Cottage Cheese—A soft cheese made from sour skim milk, reconstituted concentrated skim milk or nonfat dry milk, curdled either with starter alone or with starter plus rennet, also known as Pot, Dutch or Schmierkäse. The large grained, low acid variety is called sweet-curd, flake type and low acid rennet type Cottage cheese. Because the large particles of curd resemble popcorn it is also called Popcorn cheese. The small grained variety is known as country style or farm style cheese. When the cheese contains 4% or more fat it is called Creamed Cottage. Cottage cheese is perishable and should be stored at low temperatures. It has many uses and provides a convenient way of using surplus milk. Large quantities are consumed as table cheese and in salads. See directions for making in Handbook Section.

Approximate percentage analysis: Water 71.479%, Proteins amides, etc. 12.6-21.1%, Fat 4.19% and Ash 2.11%.

Cottage, (Bordens)—An unripened cheese made from curd of pasteurized skim milk. Often enriched by addition of sweet cream.

Cottage, (Long time long setting over night)—The skim milk at 72° F. is inoculated with 0.3 to 1% starter and with rennet (1 ml per 1000 lb of milk). The curd is cut when the acidity of the whey reaches 0.5% (pH of curd 4.6-4.7) after about 12-15 hours. The amount of inoculum can be varied so that the time of cutting conforms to plant operations.

Cottage, (Creamed)—The addition of homogenized cream to cottage cheese so that the resulting product has at least 4% fat by weight of the finished product. The

cream and cottage cheese should be held for 16 hours at 35° F. to allow the cream to become absorbed.

Federal Standards—Moisture, not more than 80%; Fat, not less than 4%.

Cottage, (Cubed) (also called Rennet Type Cottage Cheese)—A cottage cheese in which the cubes retain their shape after being cut with ½ inch curd knives instead of being broken into small irregular-shaped pieces. The curd after cutting, is stirred very gently with a stainless steel agitator or rake, while heating slowly. A longer time is required for heating and the temperature often need go no higher than 110° to 115° F.

Cottage, (Low Acid, Popcorn or Sweet Curd)—Cottage cheese made in large flakes by the use of rennet, with large amounts of water to reduce the acid flavor.

Cottage, (Short time)—The skim milk at 85-90° F. is inoculated with 4-5% starter and with rennet (1 ml. per 100 lb. of milk). The firmed coagulum is cut in approximately 5 hours.

Coulommiers—A soft, mold-ripened, unwashed cheese first made near Coulommiers, France. This cheese is similar to Brie and Camembert and the making procedure is similar to Brie.

Cream—A soft, mild, rich, uncured cheese made from cream or a mixture of cream and milk. One of the most popular soft cheeses in the United States. Because of its soft consistency, its buttery, smooth texture, its pleasant aroma and its rich flavor, it is very popular as a spread for bread and in sandwiches or salads. See Handbook.

Cream (Canada)—Standards: Soft uncured cheese of not more than 55% moisture, not less than 65% milk fat.

Cream Spread, Dahlberg (Geneva)—For 100 lb. of cheese the following is used; 93 lb. of cream of 40-42% fat, 5 lb. of nonfat dry milk, .75 lb. of salt, .5 lb. of powdered agar. This mixture is heated to 180-185° F. for 5 minutes. Cooled to 110° F. and 0.75 lb. of lactic starter is added. This mixture is homogenized at 3500-4000 lb. pressure and is packaged in the final container. The packaged cheese is cooled to 70° F. and is held at this temperature until the desired flavor has developed after which it is chilled and stored at 40° F.

Creole—A soft, rich, unripened cottage-type cheese mixed with cream. Produced for the New Orleans market.

Crescenza; Carsenza, Stracchino Crescenza, and Crescenza Lombardi—An uncooked, soft, creamy, slightly sweet, fast ripening, Bel Paese-type of cheese made in Northern Italy.

Creuse—A skim milk cheese made in the department of Creuse in France. The curd is produced either by rennet or by heating the sour milk. The curd is then put into perforated earthenware molds about 7 inches in diameter and 5 or 6 inches in height. After draining for several days the cheese is removed from the molds, salted and frequently turned. In time it becomes very dry and hard and may be preserved for a year or even longer. The cheese is also ripened by placing in tightly closed receptacles lined with straw, in which case it becomes yellow and soft and acquires a very pronounced taste.

Crustless—An early name applied to process cheese. (Br.)

Current—A classification of American Cheddar not over thirty days old.

Daisies—Cheddar cheese in cylindrical form, 12-13 inches in diameter, and weighing about 20 lb. each. See Cheese Styles.

Daisy Brick—A brick cheese 13½" in diameter, 4½" high and weighing 20-22 lb.

Damen; Gloire des Montagnes—A soft, uncured cheese of Hungary.

Danish Export—A small, flat, cylindrical cheese made from skim milk and buttermilk coagulated with rennet. The curd is cut, dipped into forms, kneaded, pressed, and brine salted.

Dariworld—A semi-soft ripened cheese with a mild, pleasing flavor and a smooth slicing body, developed at the University of Wisconsin.

Dehydrated—The commercial product is formed by mixing dry skim milk solids and whey solids with ground, aged cheese until the moisture content is reduced to the desired level. A flavoring for soups, macaroni and similar dishes.

Another type product is pure dehydrated cheese.

Delft—A Netherlands, spiced cheese from partially skimmed milk. See Leyden.

Derbyshire or Derby—A cylindrical shaped hard sweet-curd cheese made in Derbyshire England. Similar to Cheddar but not as firm is flakier and has a higher moisture content. Starter and rennet are added to milk after which it is cut and cooked at 96° F. After 40 minutes it is milled.

Devonshire Cream—An English cheese made from scalded cream which has been set in molds to harden and drain before being placed on the market.

Domian—A popular Egyptian cheese made from partly skimmed cow's or buffalo's milk. It is soft white mild and salty with no openness. 3-15% salt is added to 2½% of the milk before the addition of rennet and the rest is heated to 170° F. The portions are mixed and the rennet is added at 115° F. If it is to be cured it is pickled in salt whey or salt milk brine. The cheese is cured 4-8 months.

Dorset Dorset Blue, Blue Vinny, Blue Veiny—A hard blue veined English cheese. It is made from partially skimmed milk and weighs from 14 to 16 lb. The cylindrical shaped cheeses are dry crumbly sharp and white with blue veining throughout.

Dotter—A cheese made in Nuremberg Germany by mixing egg yolk and skim milk.

Drum Swiss—Circular in shape from 28-38 inches in diameter and from five to twelve inches in height.

Dry—known also as Sperrkäse and Trockenkäse. It is made in the small dairies of the eastern part of the Bavarian Alps and in the Tyrol. It is an extremely simple product made for home consumption and only in the winter season when the milk can not be profitably used for other purposes. As soon as the milk is skimmed it is put into a large kettle which can be swung over a fire where it is kept warm until it is thoroughly thickened from souring. It is then broken up and cooked quite firm. A small quantity of salt and sometimes some caraway seed are added and the curd is put into forms of various sizes. It is then placed in a drying room and when it becomes very hard it is ready for eating.

Dry Cured—A cheese cured dry without any development of smear or mold growth.

Duef—A soft-cured rennet cheese made from cow's milk. It is an Austrian product 2 1/2 by 2 by 1 inch in size.

Dunlop—The former national cheese of Scotland. It has been almost superseded by Cheddar cheese which it resembles.

Dutch—A small round hard cheese made from skim milk. Also called Cottage cheese.

Edam—A Dutch cheese with a mild nutty flavor which is shaped like a flattened can non ball and covered with red wax. It originated near Edam, Holland.

Pasteurized raw milk of 25% fat is normally used. About 1% starter is added to milk at 88° F and the milk is set with rennet. After 15 minutes the curd is cut into 3/4" cubes and cooked to 90-95° F. The whey is removed until the curd is exposed. Water or weak brine may be added to the curd which is then placed into hoops for draining and pressing. The cheese may be dry or brine salted. It is washed, dried and turned and usually colored red. *Analysis*—Moisture 33-40% Fat 26-30% Salt 1.6-2% Federal Standards—Moisture not more than 45% Fat not less than 40% in the solids.

Egg—A whole milk cheese made in the province of Nyland, Finland. It is made with fresh eggs at the rate of 2 to 12 added to each 6 quarts of new milk.

Elisavetpölen—See Eriwani Cheese.

Emiliano—A hard dry grating cheese of Grana or Parmesan types. May be the same as Reggiano.

Emmentaler—See Cheese Swiss.

Engadine—A rennet cheese made from whole cow's milk in the Canton of Grisons, Switzerland.

English Dairy—A very hard cheese which resembles Cheddar cheese but is cooked much more.

Epoisse—A soft rennet cheese made from whole or partially skimmed milk in the Department of Côte d'Or, France.

Eriwani—Karab Kurini Elisavetpölen—A cheese made from sheep's milk in the Caucasus. Fresh milk is set at about 95° F with enough rennet to coagulate it in 20 minutes. The curd is broken up and the whole is put in a sack allowed to drain and then pressed with stones until the whey stops running. The cheese is salted in brine.

Ervy—A soft Camembert type cheese made in the Village of Ervy, France.

Export—Cheddar cheese 14-15 inches in diameter and weighing 60-70 lb. Also termed Cheddar.

E-Z Cheez (Whitson's)—Spray-dried bakers cheese for cheese cake and other pastries.

Farm, (Fromage a la Pie, Mou, Maigre & Ferme)—A French cheese made from skim milk and closely resembling the Farmers or Pressed cheese of the United States.

Farmhouse Cheddar—A cheddar type cheese made on the farm from the milk produced on the farm.

Feta—A white, soft, so-called pickled cheese made by the shepherds near Athens, Greece, from ewe's or goat's milk.

Filled—A cheese made in the manner normal for that variety but whose fat has been wholly or partially replaced by vegetable fats. Filled cheese is illegal in most states of the U. S.

Fiore Sardo—A hard Italian cheese made from ewe's milk.

Firm Close—Cheese which is compact, firm, and practically free from openings.

Flake-type Cottage—See Sweet Curd Cottage Cheese.

Flats—Whole milk American Cheddar cheese in the shape of cylinders 14 to 15 in. in diameter and $5\frac{1}{2}$ to 6 in. in height, and weighing 30 to 35 lb. When two of these cheeses are packed in a box for shipping, one on top of the other, they are called "twins." When packed separately, they are called "singles."

Flotst—A boiled-whey cheese made in Norway similar to Mysost but a little richer.

Flower—A cheese so named because flower petals such as roses or marigolds are added. It is a soft-cured rennet cheese made in England from the whole milk of cows.

Foggiano—A ewe's milk cheese of Italy similar to Cotrone and Moliterno.

Forez, (d'Ambert)—A cheese made in central France. The process is very crude and the ripening is unusual, the cheese being ripened by placing them on a cellar floor, covering them with dirt, and allowing water to trickle over them. Many are spoiled by growths of mold and bacteria. The best has a flavor similar to that of Roquefort cheese.

Formageffe—A small, soft-ripened rennet cheese made from cows' milk in northwestern Italy, during the spring or autumn.

Formaggi di Pasta Filata—A group of Italian cheeses which when plastic and hot are kneaded, pulled, and shaped. Some of the common types are Provolone, Caciocavallo, Mozzarella, Provatura and Scamorza.

Fresa—A mild soft, cooked, cow's milk cheese of Sardinia (see Cooked).

Fresh—See Green Cheese.

Fribourg—A hard cheese made similar to Swiss cheese in Switzerland and the Po valley. May be the same as Spalen.

Friesian Clove—A spiced cheese of partially skimmed cow's milk made extensively in the Netherlands. See Spiced cheese.

Fromage a' la Creme—A soft, rich, un-ripened cheese made with rennet, milk and cream.

Fromage Fort—A variety of cheese prepared in France by melting well-drained skim milk curd, subjecting it to a pressure and burying in dry ashes to remove excess whey. The curd is then grated and allowed to ripen for 8-10 days after which milk, butter, salt, pepper and wine are added and the mixture is further ripened.

Fruhstück—A Limburger type of cheese made in a round mold about 3 inches in diameter. During curing, yeasts and molds grow on the surface, followed by the so-called red cheese bacteria and smear development. It is wrapped in foil or parchment and cured.

Funposino—A Macedonian cheese similar to Brinsen and made from sheep's milk.

Full-cream—Cheese made from whole milk.

Full Fat—A cheese made with whole milk from which no fat has been removed.

Gaiskäsli—A soft, goat's milk cheese of Germany and Switzerland which ripens in 3 weeks.

Gammelost—A Norwegian, semi-soft, blue-mold ripened cheese with a sharp aromatic flavor. Lactic starter is added to skim milk and after souring for a day or two the milk is warmed to 145° F. After 30 minutes at this temperature the curd is dipped into cloth bags and pressed. The curd is removed, packed in cloth lined forms and placed in boiling whey for $3\frac{1}{2}$ hours. The next day the cheese is pierced and inoculated with a *Penicillium roqueforti* or related mold. The main ripening molds are: *Mucor*, *Rhizopus* and *Penicillium*. The cheese is cured for 4 weeks at 50-55° F. Federal Standards—Moisture not more than 52%.

Gautrais—A cylindrical cheese weighing about 5 lb and similar to Port du Salut. It is made in Mayenne, France.

Gavot—A cheese made from goats' sheep's or cows' milk in Hautes-Alpes, France.

Geheime Rath—A deep yellow-colored cheese made in small quantities in the Netherlands. It resembles a small Gouda cheese in quality and process of manufacture.

Gerôme Gerardmer—A soft cheese made in the Vosges mountain region of France and Switzerland. Cows' milk plus some goats' milk may be used to make this $\frac{1}{2}$ to 5 lb cheese which when cured may have a greenish tint.

Gervais—A French cream cheese of the Neufchâtel group made from a mixture of whole milk and cream. The cheese is usually consumed while fresh but may be kept for several days.

Gex—A hard rennet cheese made from cows' milk and belonging to the class of blue mold cheese known in France as Fromage Persillé. It has been made in the town of Gex for about 70 years. The ripened cheese weighs about 15 lb. The Penicillium type mold is not introduced into the interior of the cheese as is done in the case of Roquefort. The 3-4 months ripening takes place in caves or cellars.

Girlev—A hard rennet cheese made in Denmark from skim milk of cows.

Gjetost—A Norwegian whey cheese in which the whey is condensed 4 to 1. The cheese is golden brown, composed mainly of lactose. Gje is indicative of a goat's milk product. See Mysost.

Glarnerkase—See Sapsago Cheese.

Gloucester—A firm, smooth, waxy, close-textured hard cheese made in Gloucestershire, England. Similar to Derby in character and in making procedure. When the cheese is a month old, it is colored red or brown. Well-developed blue molds are often found on the sides.

Glumse—A cottage cheese made from sour milk in western Prussia. Milk or cream is added to the cheese just before eating.

Goat's Milk—Many varieties are made using goat's milk instead of cows' milk. Often goat's milk cheese or mixtures of goat and cows' milk cheese are not identified. In France, Chevre or Chevroin designate goat's milk cheese. In Italy, Formaggio di

Capra designates goat's milk cheese and the term caprino is indicative of a goat's milk product. In Germany, Ziegenkäse or Gaiskäse designate goat's milk cheese. Goat's milk cheese is likely to have a sharper flavor than that made of cows' milk due to the higher caproic and caprylic acid content.

Goliath—A large style of Cheddar cheese which may weigh several tons, generally made for special occasions.

Gomost—A Norwegian whole milk cheese made similarly to Mysost.

Gorgonzola—A semihard rennet curd mold-ripened cheese made chiefly in Italy. It is ripened in cool valleys in the Alps for periods up to one year. It is cylindrical in shape, crumbly in texture, streaked with mold, and at its best the flavor resembles that of Roquefort. Federal standards—Moisture not more than 42%. Fat not less than 50%.

Gouda—A variant of Edam cheese made in southern Holland. Its chief difference being its shape and fat content. The diameter of the top and bottom surfaces is about 6 $\frac{1}{4}$ inches and the cheese slopes outward to the middle where the diameter is usually about 14 inches and 4 $\frac{1}{2}$ -5 inches deep. It is made in much the same way as Edam. Milk is set at 84-90° F, cut, cooked at 100-106° F and drained. The curd is brine or dry salted and is aged at least two to three months. Baby Goudas of about one pound are quite popular in the United States. Federal Standards—Moisture not more than 4%. Fat not less than 46% in the solids.

Gournay—A soft rennet Neufchâtel type cheese deriving its name from Gournay, France, the village in which it is made. It is 3 inches in diameter and about $\frac{1}{4}$ of an inch thick.

Goya—An Argentine cheese made from whole or partially skimmed milk which resembles a medium-cured Asiago.

Grana—A class of Italian cheese with granular body, sharp flavor and grating characteristics. This class of cheese has excellent keeping quality even under adverse conditions. Types of this class of cheese are Parmesan and Reggiano.

Granular Curd—A cheese made in a manner resembling the regular cheddar process except that it is not matted or milled. The curd is cooked firm, whey is drained, curd

is stirred until proper acidity develops and the curd is salted and pressed. Some salt may be added immediately after dipping to prevent the curd from matting. Federal Standards—Moisture, not more than 39%; Fat, not less than 50% in the solids.

Grating—A hard, dry, low moisture cheese which is grated into foods as a condiment. A grating cheese of the Grana type is usually well aged. Federal Standards—Moisture not more than 39%; Fat, not less than 50% in the solids.

Gray—A sour milk cheese of the Tyrol. When ripe the cheese has a pleasant taste and a gray appearance throughout. To insure proper ripening a little grated well-ripened gray cheese or bread crumbs with the characteristic mold growth are mixed with the curd. The cheese is cured at 70° F.

Green—Cheese which is newly made and which has not been ripened or cured. Also called Fresh Cheese. It lacks the characteristic cheese flavor.

Grinder—A Swiss cheese which does not meet the requirements for higher grades but is used in the manufacture of pasteurized process cheese or pasteurized process cheese foods.

Grünerkäse—Sapsago Cheese.

Gruyère—(1) Swiss Cheese made in the Gruyère district of southern France. Also called Emmental and Schwiitzer. Similar to Swiss except that it has smaller eyes and a sharper flavor, and a second fermentation takes place which produces a smear growth on the surface. (2) The trade name of Swiss cheese processed and packaged in tinfoil. It differs from ordinary Swiss in having no gas holes. Federal Standards—Moisture, not more than 39%; Fat, not less than 45% in the solids.

Güssing—An Austrian skim milk cheese resembling the Brick cheese of the United States, the process of manufacture also being similar, except that skim milk is used. It weighs from 4 to 8 lb.

Half Fat—A cheese made with half whole milk and one half skim milk.

Hand—A sour milk cheese so named because of the fact that it is molded into its final shape by hand. It is very popular with German people in Germany and several other European countries as well as in certain sections of the U. S. The curd is prepared much as rottage cheese curd

with or without rennet, heated to 120 F. for 3 hours and then drained after which the curd is mixed thoroughly or ground in a curd mill and salted. It is sometimes flavored with caraway seed. Then the cheese is hand molded or pressed into small forms of desired shape and dried in a warm room. It is cured for 6-8 weeks in a moist room at about 50° F. Well-ripened Hand cheese has a sharp, pungent flavor and aroma.

Harz or Harzkäse—A Hand cheese made in different sizes. It is made by the same process as Hand cheese.

Hauskäse—German name for a Limburger-type cheese.

Hay—A skim milk cheese made in the department of Seine-Inferieure, France, and known there as Fromage de Foin. The name comes from the fact that it is ripened on freshly cut hay, giving it its characteristic aroma. It remains buried in hay for 6-12 weeks after which it is ready for sale. Consumed locally.

Herkimer or Herkimer County—An acid-type Cheddar cheese formerly made in large quantities in Herkimer County, New York. Now a trade name for a brand of Cheddar cheese.

Herrgårdssost—A popular, medium firm, mild, nutty cheese of Sweden which has a pliable body and a pleasing aroma. The cured cheese contains eyes similar to those of Gruyère, or smaller than Swiss. The curd is settled under the whey in rectangular portions and is pressed in the vat. Similar cheese in this country is called Herrgård or Iowa Swiss.

Hervé—A Limburger-type cheese made in Belgium.

High Colored—Cheese of a reddish shade or extremely high color. This is not associated with any flavor. This cheese may be preferred in some markets and objected to in others.

Hohenheim—A soft cheese, cylindrical in shape, 4 to 6 inches in diameter, and weighing about ½ lb. It is made in Hohenheim, Germany from partly skimmed milk.

Holstein Health, (German)—A cooked cheese made from sour skim milk, the local name being Holstein Gesundheitskäse.

Holstein Skim-milk (Holsteines Magerkäse, Battenkäse)—A kneaded skim milk cheese of Prussia to which may be added caraway seed.

Home Trade—A variety of Cheddar cheese cylindrical in shape weighing 20 to 25 lb with a diameter of approximately 12 inches (formerly used)

Hop—A German cheese also called Hopfen. After the cheeses are made they are placed in a well ventilated room and allowed to dry. They are then packed and cured in hops.

Hot Pack Process of Cream—After drainage of a cooked curd cream cheese a vegetable gum is added and the mixture is heated to 125-175° F and homogenized at 1000 to 3,500 lb. The mixture while hot is run into suitable containers.

Hvud Cjeseost, (White Goats Cheese)—A goats milk cheese made in Norway. The curd after being broken up and cooked in the usual manner is pressed into forms 9 or 10 inches long 6 inches broad and 4 inches high. It is made only for local consumption.

Ilha—A cows milk cheese made in the Azores Islands and imported to a great extent into Portugal. It is moderately firm 10 to 12 inches in diameter and about 4 inches thick.

Incanestrato, (basketed)—A Pasta Filata cheese made in Sicily to which various spices are added. A kind known as "Majocchino" is made in the region of Messina of cows goats or sheeps milk and contains olive oil. It is first pressed by hand and allowed to ferment for 2 or 3 days when it is cooked in whey then pressed salted and spiced. The curd is pressed in wicker baskets the imprint of which remains on the cheese.

Iowa Swiss—See Herrgårdssost

Isigny—An American cheese originating 40 years ago during an attempt to make Camembert cheese here. It is slightly larger than Camembert though of similar shape. When ripe it resembles mild Limburger.

Island of Orléans—A soft piquant cheese with a strong characteristic flavor made for 300 years on the Island of Orléans in the St. Lawrence River below Quebec. The round flat 5 oz. pieces of cheese are ripened by surface yeasts and molds. The cheese are fully cured in three weeks.

Italian—A group of cheese including Parmesan Ricotta Provolone Romano Mozzarella and other cheese of Italian origin.

Jack Monterey—A variety of Cheddar cheese manufactured by the stirred curd method. It was made first in Monterey County California. After sufficient stirring the curd is wrapped in cheese cloth and rolled before pressing. Generally called Monterey Cheese. Federal Standards Moisture not more than 44% Fat not less than 70% in the solids.

Jochberg—A cheese made in the Tyrol from a mixture of cows and goats milk. It is 8 inches in diameter 4 inches in height and weighs 4 lb.

Josephine—A soft rennet cheese made in Silesia from whole cows milk and cured in small cylindrical packages.

Jumbo Brick—A Brick cheese pressed into a rectangular shape weighing about 10-11 lb.

Junior—See Cheese Grades

Junior Twin—A style of Cheddar cheese cylindrical in shape and weighing 11 1/2 lb.

Kajmak—The Turkish word kajmak means cream and is used to designate a product made in Serbia and sometimes known as Serbian butter. It is similar to a cream cheese. The flavor varies between that of goats milk cheese and Roquefort.

Karab—See Cheese Enwani

Kareish—A skim milk so called pickled cheese made in Egypt. See Cheese Domiat.

Karut—A very hard dry skim milk cheese made in Afghanistan and northwestern India.

Kasach—See Cheese Enwani

Kaskaval—A loaf shaped rennet cheese weighing 4-6 lb made in Bulgaria Roumania and Transylvania from partially skimmed sheep's milk.

Kasseri—A hard Creek cheese from ewes milk.

Katschlawalj—A sheep's milk Caciocavallo-type cheese made in Serbia Rumania and Bulgaria. Each cheese weighs about 6 lb.

Katzenkopf—See Cheese Edam

Kefalotyri, (resembling a Greek hat Kefalo)—A hard grating type goat's or ewes milk cheese of Greece and Syria. A goat's milk cheese of this type is also made in the Ozarks Missouri and Arkansas.

Kirgischerkäse—See Cheese Kruit

Kjærsgaard—A hard skim-milk cheese made in Denmark from cows' milk.

Kloster—A soft-ripened Romadur-type cheese made in Germany from whole cow's milk. It has a somewhat unusual shape, 1 x 1 x 4 inches and weighs less than 4 ounces.

Knaost—See Cheese, Pultost.

Kolos-Monostor—A sheep's milk rennet cheese made in the Agricultural School in Transylvania. The cheese is rectangular in shape and weighs about 4 lb.

Kolostarer—A cheese made from buffaloes' milk, resembling Trappist cheese when ripened.

Kopanisti—A Greek, blue-mold, sharp peppery cheese which is kneaded by hand into orange-sized balls. These balls develop mold and are again kneaded with salt and mold until thoroughly mixed. The cheese are cured for 1-2 months.

Koppen—A sour-milk cheese made by herders between Bohemia and Silesia. The cheese, 1-2 lb. in weight, conical or cylindrical in shape, have a sharp pungent flavor.

Kosher—A cheese typically made without animal rennet for the Jewish trade. Sometimes a starter is used, or the milk is allowed to sour naturally. Soft varieties such as Kosher Cream, Cottage, and Gouda are popular. All cheese for this market bear an identifying Kosher stamp.

Kosher Gouda—Gouda cheese bearing a stamp whereby the Jewish trade for whom it is made can identify it.

Kräuterkäse—See Cheese, Sapsago.

Krutt (Kirgischerkäse)—A sour skim milk cheese made in the Asiatic Steppes, from the milk of cows, goats, ewes or camels. The curd is drained, made into small balls and sun dried.

Kühbacher - Kumbach—A soft, ripened cheese made in upper Bavaria, Germany from whole or partly skimmed cow's milk. It is cylindrical in shape and weighs 2-7 lb.

Kuinost, (Kommenost)—A special Scandinavian cheese made from whole or partially skimmed milk. This Colby-like curd is formed into 5 lb. loaves and flavored with cumin or caraway seed.

Kummelkäse—A German cheese containing caraway seeds.

Kurini—See Cheese, Eriwani.

Labneh—A sour milk cheese comprising one-third of the cheese made in Syria.

Laguiole, (Guiole)—A hard rennet cheese similar to Cantal cheese.

Lancashire—An English cheese of Lancashire County, from which it derives its name. Similar to Cheshire but white in color, softer, moister and with a higher flavor.

Langres—A soft rennet cheese deriving its name from the village of Langres, France. It is consumed locally. Each cheese weighs about 2 lb., is about 8 inches high, and 3 inches in diameter.

Lapland—A cheese made by the Laplanders from the milk of reindeer. It is round, flat, and dumb-bell shaped in cross-section, and resembles a very hard Swiss.

Latticini—Buffalo milk cheese made in the vicinity of Naples, Italy.

Leaf—See Cheese, Tschil.

Leather—Cheese made from cows' skim milk and buttermilk in Schleswig-Holstein. When cured it weighs about 20 lb., is about 5 or 6 inches high, 10-12 inches in diameter, cylindrically shaped, and has small eyes.

Leicester—A hard rennet cheese made in Leicester County, England. It resembles Cheshire and Cheddar. The cheeses are 18 inches in diameter, 6 inches thick and weigh 40 lb. They are usually cured for as long as a year.

Lescin—A sheep's milk cheese made in the Caucasus.

Leyden, (Komijne Kaas)—A hard spiced cheese made in the Netherlands, the farm product containing about 10% more fat than that made in the cheese factories. The curd is placed in the hoops in three layers. Cumin seed and cloves are added to the curd for the middle layer. It weighs 8-20 lb. and is usually round and flat like Gouda.

Liederkrantz—A cheese made in Ohio, under a copyright. It is rectangular in shape, being about 1 x 1½ x 3 inches in size. The cheese is somewhat similar to Limburger in body, flavor, aroma and degree of ripening.

Limburger—A soft rennet cured surface ripened cheese made from fresh whole or partly skimmed milk. It is made similar to Brick in the U. S. except that the curd is much softer. After cutting, draining and salting the cheese is ripened from one to two months. The ripening room should have a relatively high humidity and a temperature of about 60° F. When ripe the cheese possesses a very strong odor and flavor. Limburger was first made near Limburg, Belgium and is now made in large quantities in New York and Wisconsin. Surface ripening organisms are responsible for the characteristic flavor and aroma. Film yeasts predominate at first followed by *B. linens* and the reddish yellow smear. Federal Standards—Moisture not more than 50% Fat, not less than 50% in the solids.

Liptauer—A sharp-tasting cheese made in Hungary and similar to Emmentaler cheese. Condiments are often added to it.

Livarot—A soft rennet cheese made in France and deriving its name from the village in which it is made. It is much like Camembert. When ripe the cheeses are wrapped with laiche leaves (*Typha latifolia*). In about four months, they are colored with annatto and marketed.

Loaf Cheese—Refers to any cheese made in loaf form. Formerly referred to Process cheese.

Lodigiano—A Grana or Parmesan grating cheese made near Lodi, Italy. The 65-110 lb cylindrical cheese has a dark oiled surface and a yellow interior. The cheese which has eyes is sharp, fragrant and sometimes slightly buttery. It may be cured as long as three or four years.

Lombardo—An Italian Grana or Parmesan cheese similar to Lodigiano. This sharp aromatic cheese with a granular texture is used for grating.

Longhorn—A cylindrical-shaped Cheddar cheese approximately 5 inches in diameter and weighing about 12 lb. It is characterized by a more open texture, high moisture and faster ripening than larger types of Cheddar.

Lorraine—A small hard cheese made in Lorraine, Germany. It is seasoned with salt, pepper, and pistachio nuts, and is a local delicacy. It weighs 2 ounces and is expensive.

Lunch Cheese—See Cheese, Fruittück.

Lunenburg—A cheese made in the Voralberg Mountains of western Austria. Saffron is used in coloring. When ripe the cheese resembles a cross between the Emmentaler and Limburger types of cheese.

Maconnais—A cheese 2 inches square by 1½ inches thick made in France from goat's milk.

Maqueline—A soft rennet cheese of the Camembert type made around Senlis, France and weighing ¼ lb.

Maisle—A sheep's milk cheese of the Crimea which may be kept in a salt brine for as long as a year.

Maisle Pater, (fat cheese)—A Crimean crumbly open textured pleasant flavored cheese of ewe's milk.

Mainauzer—A cheese named for an island in Lake Constance between Germany and Switzerland. The cheese is similar to Raddolfer cream cheese and to Munster. The cheese is cured similarly to Munster.

Manner Hand—A German cheese made by the usual hand process, which is ripened in a cellar from 6-8 weeks. See Hand Cheese.

Majocchi—See Cheese, Incanestrato.

Malakoff—One form of Neuchâtel cheese of France, ½ inch thick and 2 inches in diameter.

Manbollen—See Cheese, Edam.

Manteca (Manteche)—A whey butter of Italy produced as a byproduct of Caciocavallo and Provolone, is enclosed in a bag of plastic curd. Heated plastic curd (made like Scamorza) is formed into a bag, ¼ ½ lb of butter is put in the curd bag and the edges are sealed. The "cheese" is shaped like small Caciocavallo which is usually smoked.

Manur—A cheese made in Serbia from either sheep's or cows' milk. The milk is first heated to the boiling temperature and then cooled until the fingers can be held in it. A mixture of buttermilk and fresh whey with rennet is added. The curd is lifted from the whey in a cloth and allowed to drain, then it is kneaded like bread, lightly salted, and dried.

Marquise—A soft brick-shaped cheese made in Belgium and known there as Fromage Mou.

Marzese—A hard Pecorino cheese of Tuscany, Italy.

Marienhöfer—A Limburger-type, tinfoil-wrapped cheese made in Carinthia, Austria.

Märkisch Hand—A normal Hand cheese except that the curd is highly pressed after salting.

Marolles—A soft, cow's milk cheese of the Pont l'Évêque type made in France. Several types and shapes are made and are known by different names. The Boulette type is pear-shaped, while the Dauphin is half-moon shaped and flavored with herbs.

Mascarpone—A soft, cream cheese of Italy about $2\frac{1}{2}$ inches high and 2 inches in diameter. It is eaten fresh.

Mecklenburg Skim—A hard, skim-milk cheese first made in Mecklenburg Province in Northern Germany.

Medium Close—Cheese which is moderately compact and firm with a few mechanical openings.

Medium Colored—Cheese having not more than a deep shade of dark straw color.

Melun, Brie de Melun—A French cheese which is sharper and firmer than Brie. (See Brie.)

Mesitra—A soft cheese made in the Crimea from fresh sheep's milk with the use of rennet. Usually it is eaten fresh without salt.

Michigan Farm—See Skanausia Suria.

Midgots, (Picnic, Junior Twin, Comodore)—Styles of Cheddar cheese 4 x 9 $\frac{3}{4}$ inches and weighing 10 $\frac{1}{2}$ -12 $\frac{1}{2}$ lb.

Mignot—A soft rennet cheese similar to Pont l'Évêque, that has been made for a century in the Department of Calvados, France. Two types are made, white and passé, the former being a fresh cheese and the latter a ripened cheese.

Milano, (Stracchina di Milano, Fresco, Quarto, Stracchino Quattrolo)—A sweet, fast-ripening cheese made in Lombardy, Italy similar to Bel Paese.

Mild—Cheese which has a mild flavor.

Military Brand Camembert—A soft, natural cheese packed in a half circular plastic box containing three portions weighing 1 $\frac{1}{4}$ oz. each.

Minutira—A soft cheese made of ewe's milk in Macedonia.

Mish—A soft, ripened Egyptian cheese usually made from skim milk cheese to which whole milk and other flavoring and nutritive substances are added. The mixture is stored under microaerophilic conditions in an earthenware pot, called "Balas" for a period of one year before it becomes "Mish." When it is well ripened it has a sharp, pungent taste with a somewhat butyric odor resembling Romano and Roquefort cheese.

Mitzithra, Pot—The whey from Feta cheese is mixed with fresh milk, usually ewe's milk and curdled. The resulting cheese, made near Athens, Greece, is eaten fresh.

Modena, Monte—Parmesan-type cheese made in the U. S.

Mojochino—See Incanestrato Cheese.

Moliterno—A Pasta Filata cheese originally made in Calabria and Lucania, is now made in Basilicata, Italy. The cheese is made by the same process as Caciocavallo and is similar to Cotronese.

Moncenisio—An Italian, blue-mold, Gorgonzola-type cheese.

Mondseer Schachtelkäse—A popular, Munster-type cheese of Austria which is made from whole or partly skimmed milk. The smear-ripened cheese is sharp and acid in flavor, similar to a mild Limburger. The whole milk cheese is called Mondseer Schlosskäse.

Monostorer—A ewe's milk cheese made in Transylvania, Rumania. The cheese are brine-salted for two days and cured for 8-10 weeks.

Montasio—A rather strong rennet cheese that is made in parts of Austria and Italy. After the cheese is pressed, it is salted for a month (about 3% of the weight of the cheese is the weight of salt applied). Fresh cheeses are nearly white; old ones are yellow, granular, and have a characteristic odor.

Montavoner—An Austrian sour milk cheese. Dried herbs are added during the process of making.

Mont Cenis—A rather large cheese resembling the imitation Roquefort varieties such as Gex. It is 18 inches in diameter and weighs about 25 lb. It is made in southeastern France. A penicillium mold is sometimes incorporated in the curd.

Mont d'Or—A soft cheese of the Pont l'Evêque type made from cows milk and deriving its name from Mont d'Or near Lyon France. It is a small cylindrical cheese and much of it is sold while still fresh.

Monterey, Jack—A high moisture fast curing cheese developed in Monterey County California about 1892. The cheese is made similar to Colby. Water at 86° F is added to the granular curd. The curd is placed in bags for draining and is pressed in these bags. The finished cheese is about 9½ inches in diameter and weigh 6-9 lb. Federal Standards—Moisture not more than 44% Fat not less than 50% in the solids.

Monthery—A soft cheese like Brie made in France from cows milk to which rennet has been added in curdling. It is made in 2 sizes 5½ and 3 lb each being round and flat. During the process of ripening white mold and later peculiar blue mold with red spots appear on the outside surface of the cheeses.

Mozzarella—A soft plastic curd cheese made in Latium and Campania in Southern Italy. This cheese was originally made from buffalo milk but is now made from cows milk. The making procedure is similar to Caciocavallo and Scamorza. The cheese which weighs approximately 1 lb is eaten fresh. Mozzarella is now made in quantity in the U S. The curd may be wrapped in flexible wrappers and sold to the consumer or it may be sold fresh to the dealer who completes the beating and kneading. Much of the Mozzarella is used in cooking particularly in Pizza.

Mozzarella—A soft rennet cheese made in Italy from cows or buffalo milk.

Mrsav—See Cheese Sir Posny.

Munster—A semi-hard rennet-curd cheese which originated in Munster Germany. The cheese is cylindrical in form in flavor a cross between Brick and Limburger and is ripened from 2 to 3 months. Its process of manufacture is somewhat similar to that of brick cheese but has less surface smear and undergoes less surface ripening during curing. Federal Standards—Moisture not less than 46% Fat not more than 50% in the solids.

Mysost—A by product from the cheese industry of Norway Sweden Denmark and to a limited extent in Illinois Michigan New York and Wisconsin. It has a butter like consistency and a milk sweet taste but somewhat lacks flavor. Whey is strained

put into a kettle brought to a boil and the albumin which rises to the top is skimmed off. As soon as the whey evaporates to about ¼ original volume, the albumin is returned to the whey and stirred well. When the mixture is the consistency of heavy cream it is quickly poured into a container and stirred with a paddle until cool to prevent sugar crystals from forming. It is then molded. Mysost made from cows milk whey. Gjetost made from goats milk whey. Primost made from goats milk and containing more fat (buttermilk or cream). Gomost made similarly from whole milk.

Nageles (Fresh) or Nagelkassa—A Netherland skim milk cheese to which cloves and cumin are added. It is made in the shape of Derby Cheese. See Spiced Cheese.

Nan Tofu—Mongolian Cheese. The cheese is made by the natural lactic fermentation of milk. After the whey is separated the coagulated curd is taken out to be boiled and stirred up in a kettle until its serum evaporates and its viscosity increases. It is then put in a wooden box and cooled for a short time to be again coagulated and then when it is taken out and dried in the sun it is ready to be preserved in a receptacle.

Nessel—A very thin round rennet cheese made in England from cows milk.

Neufchatel—A soft cheese made originally in France from either whole or skim milk or a mixture of milk or cream. It may be eaten fresh or cured. When eaten fresh it is used like cream cheese. To cure this cheese it is placed in curing rooms and cellars where it is kept clean and turned frequently. Micro organisms such as *Mycoderma casei*, *Penicillium candidum* and *P. camemberti* and the so called red cheese bacteria grow on the surface during this period. In 3 to 4 weeks the cheese is wrapped in parchment or tinfoil and is ready to be marketed. In the United States Neufchatel is made from pasteurized milk or pasteurized milk and cream mixture in the same way as Cream cheese but with less moisture and fat. Federal Standards—Moisture not more than 65% Fat not less than 20 and not more than 33% of the finished products.

Nieheimer—A sour milk cheese named after the city of Nieheim in Westphalia where it is made. Salt caraway seed and sometimes beer are added to it during the first ripening period. Following this the cheese is cov-

ered with straw and ripened. See Hop cheese.

Noekkelost, Nögelost—A Norwegian spiced cheese similar to Kuminost and Dutch Leyden. The cheese is usually made from partly skimmed milk and in the U. S. is made into a 5-7 lb. paraffin-covered loaf.

No Grade—A cheese so marked which has not been graded. An operator who does not intend to market all of his cheese in conformity with the established grade standards shall mark all of his cheese "Not Graded."

Nostrale—This name is applied to 2 kinds of cows' milk cheese made in northwestern Italy. Formaggio Tenero, the soft type, is made in the summer time; Formaggio Duro, the hard type, is made in the spring. This is said to be an ancient variety of cheese.

Nuworld—The commercial name for a cheese ripened by a white mutant of *Penicillium roquefortii*. The flavor is similar to Blue-veined cheese. It is characterized by the presence of creamy-white mold throughout the cheese. It contains not more than 46% of moisture and its solids content not less than 50% of milk fat.

This cheese has been developed by the Dairy Department of the University of Wisconsin at Madison, Wisconsin where details regarding its manufacture can be secured. Federal Standards—Moisture not more than 46%; Fat, not less than 50%.

Oka—A soft cheese made by Trappist Monks in a monastery in Oka, Quebec, Canada, deriving its name from the location where it was first made. It is similar to Port du Salut or La Trappe.

Old Heidelberg—A soft, smear-ripened cheese made in the U. S., similar to Liederkranz.

Olivet—A soft, cow's milk cheese made in the Department of Loiret, France. The cheese is of three types—

Unripened—Made from whole milk plus the addition of cream and is similar to a cream cheese.

Half ripened or blue—Made from whole or partly skimmed milk.

Ripened—Made from whole or partly skimmed milk.

The cheesemaking process is similar to Camembert. To make the half-ripened, the cheese, after salting, is placed on straw-covered shelves until a reddish smear develops on the surface. A bluish cast appears after two weeks when the cheese is ready to be marketed. Additional ripening is given to the half ripened cheese to make a ripened Olivet.

Olmützer Quargel—A sour milk spiced Hand cheese made in Austria and Bohemia. Similar to Mainzer Hand cheese. The small, formed, dried cheeses are soaked in salty whey, before packaging. Contains caraway seed.

Oschetjepek, Oschtjepka—A plastic curd ewe's milk cheese of Slovakia made similarly to Caciocavallo.

Osetin—A rennet cheese made from cows' or sheep's milk in the Caucasus. After the curd is broken it is cooked until firm, kneaded together, and the whey is removed. The finished product is put into brine, where it may be kept for over a year. This long period in the brine produces a stronger and harder cheese than the cheese produced by a brine period of less than three months.

Ovci Sir—A rennet cheese made in the Slovenian Alps. Each cheese weighs about 8 lb.

Paglia—An imitation of Gorgonzola cheese made in Switzerland. It is a soft cheese, weighs about 2½ lb. and has a very pleasant flavor.

Pago—A rennet cheese made in various sizes from 1 to 8 lb. This cheese is made on the Island of Pago, (Yugoslavia).

Pannarone, (Stracchino di Gorgonzola Bianco, Gorgonzola Dolce)—A fast-ripening Gorgonzola-type cheese with the blue mold. This unsalted cheese is cured at 78-82° F. for the first week and the remainder of the curing (15-30 days) takes place at colder temperatures.

Parentica, Parentitza—A ewe's milk, Caciocavallo-type cheese of Hungary and Slovakia.

Parmesan—This name usually refers to hard, Grana-type cheese such as Reggiano, Lodigiano, Lombardy, Lagazzo, Veneto or Venezia and Emiliano, made near Parma, Italy, hence the name.

The above types are made in a similar manner. *S. thermophilus* is added as the culture, the curd is set, and cut into ¾"-¾" cubes, heated to 115° F.-125° F. and settled in the kettle. The curd is dipped, placed in a hoop and pressed. The curd is brine salted for 12-15 days and then dried. The cheese is cured at least a year (in the U. S. 14 months) during which time it is washed frequently and may be coated with burnt amber, lamp black or grapeseed oil. This hard, grating cheese can be kept al-

Process or Emulsified, (Canada Standards)—One or more lots of cheese with or without emulsifiers water, and solids derived from milk. If made from Cheddar or other hard cheese it must contain not more than 43% water and not less than 48% total solids.

If made from a cream cheese it has not more than 55% water and not less than 65% fat in total solids.

Provatura—An unripened soft Pasta Filata type of cheese of southern Italy. See Caciocavallo.

Providence—A cheese made in the Bric Quebec monastery Manche, France. Each cheese is about 1½ inches thick and 8 inches in diameter. It very closely resembles Port du Salut.

Provole—An uncured round Pasta Filata type of cheese made from buffalo's milk in southern Italy.

Provolone—A Pasta Filata (plastic curd) type of cheese of Italian origin which is made in many shapes and sizes and usually smoked after drying. It is light colored, mellow, smooth and has an agreeable flavor. Raw or pasteurized milk is put into a vat similar to the type used for making Cheddar cheese and then starters consisting of 1.2% *S. lactis*, 0.2% *S. thermophilus* and 0.1% *L. bulgaricus* are added. The milk is held until the acidity increases 0.01%. Rennet and a lipase enzyme extract are added at the rate of 3 oz per 1000 lb milk. After coagulation the curd is cut with ¾ inch knives. The curd is cooked to 102° F and the whey is drained when the acid in the whey has increased 0.03% or when the pH of the curd is 6.1. The drained curd is handled like Cheddar until the acidity reaches 0.4% to 0.6% and when the pH of the curd is approximately 5.3. The curd is milled into thin strips and then placed in twice its weight of water at 170° F. It is then stretched and kneaded into the desired shape and placed in cold water for hardening after which it is placed in a salt brine for a time depending upon cheese size. The cheese are then tied with rope or string and hung in a smoke room (cold smoke for 2-4 hours). It takes 100 lb of milk to make 7½ to 8¾ lb of cured cheese. Analysis—Moisture 40%, Fat 28%, Salt 3%. Federal Standards—Moisture, not more than 45%. Fat, not less than 45%.

Pultost—A Norwegian cheese made in small dairies in the mountain section. It is usually made from sour milk although rennet may be used. It is also known as Knaost or Romost.

Quacheq—A sheep's milk cheese made in Macedonia, some sour whey is added to the milk to coagulate the curd. It is eaten both fresh and ripened.

Quarter Fat—A cheese made with ¼ whole milk and ¾ skim milk.

Quartirolo—A soft, cow's milk cheese originally made in Lombardy, Italy. See Milano.

Queso Anejo, (Aged cheese)—A white, dry, crumbly skim milk, Mexican cheese. The round cheese weighing 11-22 lb is cured 6-8 months. When covered with red chile powder this cheese is marketed as Queso Enchilado.

Queso Blanco, (white cheese)—The principal Latin American cheese. This cheese is made from whole partly skimmed or skim milk. The cheese may be eaten fresh or cured from two weeks to two months. If the curd is to be pressed it is hand worked before placing in molds. The pressed curd is hard, crumbly, open and salty. Some of the cheese may be smoked. The cheese is known by many different names.

Skim milk uncured Queso de Puna—Puerto Rico. Queso Fresco—El Salvador and Venezuela. Panela—Mexico.

Part skimmed pressed Queso de Prensado—Mexico, El Salvador, Queso del Pais—Puerto Rico. Queso de la Tierra—Puerto Rico.

Skim milk pressed not cured Queso Descremado—Costa Rica. Queso Huleso—Costa Rica.

Queso de Bola—A spherical, whole milk, Edam type cheese made in Mexico.

Queso de Cavallo—A pear-shaped cheese of Venezuela.

Queso de Cincho—A sour milk cheese made in Venezuela and exported in the form of balls from 8 to 16 inches in diameter, wrapped in palm leaves. It is also known as Queso de Palma Metida.

Queso de Crema—A popular Costa Rican cheese which resembles a soft Brick. In Cuba, Venezuela and other Latin American countries this term refers to a rich, unripened, cream type cheese.

Queso de Hoja—A Puerto Rican cheese made from fresh cows milk. Curd is drained and immersed in hot water or whey at 150° F to toughen curd. Each cheese is about 6 inches in diameter, 1 or 2 inches thick, and has slightly rounded top and bottom surfaces. When cut it appears to be in layers like leaves one on top of another, hence the name signifying leaf cheese.

Queso de Mano—A sour-milk cheese resembling a Hand cheese, made in Venezuela. It is about 7 inches in diameter.

Queso de Palma Metida—See Cheese, Queso de Cincho.

Queso del Pais, (cheese of the country)—A white, pressed, semisoft perishable cheese made in Puerto Rico. The cheese is usually eaten fresh in which case it resembles Cottage cheese in body. Also known as Queso de la Tierra (native cheese).

Queso de Prensa, (Queso Blanco)—A hard, Puerto Rican cheese made from cow's whole milk. In one method the milk is ripened, set with rennet and the coagulum is broken by hand. Part of the whey is removed and the curd is drained, salted and pressed.

In a second method the milk is heated to 180° F., acetic acid is added to coagulate the milk and then sodium bicarbonate is added to neutralize the acid. The curd is cut into small pieces, salted and pressed. The cheese is eaten fresh or ripened.

Queso de Puna—A Puerto Rican cheese similar to the Cottage or Dutch cheese of the United States. The curd is put into a hoop 5 inches in diameter and 1¼ inches deep, where it remains without pressure for 2 or 3 days, or until it will keep its form. It is eaten fresh.

Queso Fresco, (fresh cheese)—A dry, Cottage-cheese type of cheese made in El Salvador and other Latin American countries.

Rabacal—A rather firm, cylindrical, flat, cheese made in the vicinity of Coimbra, Portugal, from goats' or sheep's milk. It is 4 or 5 inches in diameter and 1 inch thick.

Radener—A hard, rennet cheese made in Mecklenburg, Germany from skim milk. It is made similar to Emmentaler, except that it is pressed less, is 4 inches thick, 16 inches in diameter, and weighs about 32 lb. Known also as Skim milk Rundkäse.

Radolfreller Cream—A cheese made near Lake Constance which is between Germany, Switzerland and Austria. This Mainau-like, Munster-like cheese is made from cow's whole milk. During curing, the cheese is turned daily and later every 2-3 days. It is near ripened.

Ragnit—See Cheese, Tiltit.

Rangiport—A cheese very similar to Port du Salut. It is about 6 inches in diameter, 2½ inches thick, and weighs about 2½ lb. It is made in the Department of Seine-et-Oise, France.

Raper—See Cheese, Rayon.

Raviggiola—An uncooked, soft, sweet, creamy, fast-curing, ewe's milk cheese of Tuscany, Italy.—See Crescenza.

Rayon—A special type of Emmentaler, made largely in Switzerland, to be exported to Italy. Some is made in Italy. It is a very hard, dry cheese without eyes, and is used for grating. After curing it is sent to Turin to be dried in the dry, warm caves. Some fat leaks out and it becomes very dry and hard. It is then called Raper.

Rebbiola—A soft cheese, made for the most part in the Italian Alpine districts.

Rehlochon—A soft French cheese, made from fresh whole milk and curdled with rennet. Each cheese weighs about 2 lb. or less. A similar cheese made in Savoy, France is known as Brizecon.

Reggiano—A variety of Grana cheese which is commonly called Parmesan or Reggiano Parmesan in the U. S. This cheese was first made in Reggio Emilia, Italy. See Cheese, Grana, Parmigiano and Lodigiano.

Reindeer Milk Cheese—Made in Norway and Sweden from reindeer milk. Each is about 5 x 4 x 2½ in. in size.

Reinwald—See Cheese, Schamser.

Remoudou—See Romadour Cheese.

Requeijão—Cheese made in northern Brazil. Skim milk is held until coagulation takes place. This coagulum is heated to 175° F., drained, and pressed in bags. This curd is broken up and mixed with two parts of skim milk. The mixture is beaten, and stirred as before. The draining, pressing and washing with skim milk take place once more. Hot butterfat or cream is added and the mixture is heated. The cheese is then molded into boxes.

Reworked—1. A former name for Process cheese. 2. Also refers to cheese which is returned to be re-processed due to defective packaging, filling, or due to an undesirable moisture content.

Reworked Loaf—Older name for Process cheese.

Ricorta—See Cheese, Ricotta.

most indefinitely. Now made in some quantity mostly in Wisconsin and Michigan. Analysis—Moisture, 30%, Fat 28% Salt 4.5% Federal Standards—Moisture not more than 32% Fat not less than 32% in the solids

Parmigiano—Similar to Reggiano and is a variety of Grana cheese. The 40-80 lb cheese of 12½-18 inch diameter is coated with oil. The cheese may contain a few small eyes.

Pasta Filata, (plastic curd)—A name given to a number of Italian Cheeses such as Caciocavallo, Provolone, Mozzarella and Provatura which are dipped in hot water or whey and are kneaded, stretched and molded while in a plastic condition then placed in cold water to aid in retaining the desired shape.

Pasteurized Blended—Conforms to the definition and standards of identity of Process cheese except that in mixtures of two or more cheeses Cream and Neufchatel may be used but no blend of Cream and Neufchatel alone is used, and in mixtures of two or more cheeses containing Cream or Neufchatel the moisture content is not more than the average of the maximum moisture prescribed for such cheese.

Pasteurized—Made from pasteurized milk. The term also applies to Process cheese.

Pecorino—The Pecorino cheeses are several in number and are made in Italy from cows or ewe's milk. The most common is designated as Pecorino Romano (ewe's milk). **Vacchino Romano**—cows milk. **Caprino Romano**—Goat's milk. **Pecorino Dolce**—colored with annatto and highly pressed. **Pecorino Toscano**—smaller than Romano. Other Pecorino cheeses are—Ancona, Cotrone, Puglia and Viterbo.

Peneteleu—A Rumanian sheep's milk cheese made similar to Caciocavallo.

Pennsylvania Pot—See Cooked Cheese.

Pepato, **Siciliano Pepato**—A Romano-type spiced cheese made in Sicily and Southern Italy. Pepper is incorporated in the cheese as the curd is placed in the hoops.

Petit Carré—Same as Ancien Imperial.

Petit Suisse—A small unripened cheese of France similar to Carré but having a slightly different shape and containing more fat.

Pfister—An Emmentaler cheese made from fresh skimmed cows milk. Thought to have been first made by Pfister Huber of Switzerland. The cheeses, weighing about 50 lb., are shaped like small wheels of Swiss cheese.

Philadelphia Cream—A copyrighted trade name for a cream cheese made and packaged in tin foil or aluminum foil.

Pickled—A name which is used to describe a group of cheeses to which salt is added in large amounts or which may be preserved or cured in brine. The salt is added to prolong the keeping quality of these soft white cheeses which are made in the warm climates of Mediterranean countries.

Domiaty, **Kareish**, **Feta**, **Teleme** are typical examples.

Picnic, **Midget**, **Junior Twin**—A style of Cheddar cheese 4 inches high 9½ inches in diameter and weighing 10½ lb.

Pie—The name applied to any cheese which is used in making cheese pie, cheese cake or other bakery goods. Baker's cheese and Cottage cheese with or without a mixture of well-aged American are typical examples.

Pimento—Any kind of cheese to which pimento has been added. Neufchatel or Cream cheese are the types of cheese most often used.

Pimp—See Cheese, Mainzer Hand.

Pineapple—A hard, rennet cheese, similar in shape to a pineapple, and originating in 1845 in Litchfield County, Connecticut. It is very smooth and hard. The curd is prepared as a granular or stirred-curd cheese except that the curd is firmer. After pressing the cheese is immersed in water at 120° F., after which it is hung up in loose meshed bags to dry. While curing, the cheese may be rubbed with oil or shellacked to give a hard finish. The diagonal corrugations on its surface resemble the scales of a pineapple.

Pioma—A hard, cows milk or goats milk cheese with small eyes made in the Swiss Alps. This Tilsiter-like cheese is 12½ inches in diameter, 3 to 4 inches thick and weighs 18-30 lb.

Pont l'Évêque—A soft cheese made in Normandy, France. Mold ripened similar to Camembert, but higher temperature, shorter coagulation, draining, and curing periods are used. Cheeses are washed while curing. There is less growth of grayish white surface mold and body is firmer and deeper yellow in color than Camembert. Analysis: Moisture between 45 to 50%, Fat 25.3 to 28%.

Poono—A whole milk, smear ripened, soft cheese said to have been made originally in New York State. The cheese has a Limburger-like aroma, and a reddish smear on the surface. It is cured in 6 weeks.

Port du Salut—This cheese was developed in 1865 by Trappist Monks at Port du Salut, Department of Mayenne, France. It is now made by Trappist monks in many countries who have kept the exact process secret. Similar cheese is made outside the monasteries.

Port du Salut is similar to Pont l'Évêque with its Gouda-like or Limburger-like flavor. The cheese is flat and cylindrical, being 10 inches in diameter and 2 inches thick. It is both brine salted and dry salted, and smear ripened.

Pot—Cottage cheese made from skim milk without the addition of any cream or milk whatsoever.

A cheese of buttery consistency and a flavor resembling Camembert, originally made locally in Pennsylvania from homemade Cottage cheese. See Cottage cheese.

Potato—A cheese made in central Germany. Potatoes are boiled and mashed or grated and mixed 1 part to 2 or 3 parts of curd. Caraway seed may be added. An imitation is made in the U. S.

Potted—Originating in the U. S., it is made by grinding well-ripened Cheddar very fine and mixing it with butter, spices, etc. Better known now as Club Cheese.

Prato, Queljo Prato—A pasteurized milk, semi-cooked, Brazilian, Gouda-type cheese with small eyes.

Prattigau—A cheese named from the valley in which it is made in Switzerland. It is made similar to Limburger and weighs about 25 lb. Skim milk is used in its manufacture.

Pressed—A hard cheese, as Cheddar, that has been subjected to pressure to remove the whey, to produce physical conditions essential to ripening, and to put it in a convenient form for handling.

Prestost—A Swedish rennet cheese made from fresh cows' milk and resembling Gouda. It is cylindrical in shape and weighs from 5 to 30 lb. In Sweden it is also known as Saaland Pfarr. After the whey is drawn off, the curd is put into a cloth and kneaded. Whisky is mixed with the curd, which is then packed in a basket and after salt is sprinkled on the surface it is put into a cool, moist cellar to ripen. The cloth is changed daily for 3 days, after which the cheese is washed in whisky.

Primost—A concentrated whey cheese. It is a local name for Mysost. See Mysost.

Print—A rectangular-shaped variety of Cheddar cheese about 10 x 10 x 2½ in. in size and weighing approximately 10 lb.

Process—The clean, sound, pasteurized product resulting from the blending of one or more lots of cheese into a homogeneous, plastic mass. It is packaged in prints or boxes varying in weight from a few ounces to 5 lb.

Various lots of cheese are graded and sorted for moisture flavor, fat and body. The proper blend of body and flavor characteristics are determined and the cheese is blended accordingly. A young cheese gives a firm body while an aged cheese may give a weak body and a grainy texture. The cheese are then trimmed, ground, mixed and put into the cooker. Into this mixture may be added the necessary emulsifier, salt, cream, color and water. The cheese is usually heated by direct steam injection to at least 150° F. for 30 seconds. The fluid cheese is then filled directly into Process cheese boxes and cooled. The advantages of Process cheese may be listed as follows:

1. It is convenient to merchandise.
2. It is uniform in quality.
3. It is economical to use because there is no wasteful rind.
4. It possesses good keeping qualities.
5. It can be counted on as being a pasteurized product.

One disadvantage is that generally it has not as good flavor as the well-ripened natural cheese.

Process, Pasteurized, (Standards of Identity, U. S.)—The food prepared by grinding and mixing with the aid of heat. A blend of cheese of one or a number of varieties except some soft, high-moisture cheese like Cottage and Neufchâtel.

The cheese must be heated to 150° F. for at least 30 seconds. The moisture content must not be one per cent greater than the maximum moisture allowed for any of the varieties used. In no case can the moisture be more than 43%. The moisture content of pasteurized washed curd or Colby shall not be over 40%. The moisture content of process Swiss or process Gruyere shall not be over 44% and the moisture of pasteurized process Limburger shall not be over 51%.

The fat content must not be less than 47% of the dry matter except Swiss not less than 43% and Gruyere not less than 45%.

Emulsifying agents, acidifying agents, cream, water, salt, color and spices or flavorings may be added. (See Cheeses and Cheese Products Definitions and Standards of the Food, Drug and Cosmetic Act.)

Ricotta—A cheese made of the coagulable material composed mainly of whey albumin from the whey of Cheddar, Swiss and Provost. Sometimes called whey cheese. Ziger Schottenziger, Recruit, Broccia, Broccotte. All of the fat is left in the whey and from 5-10% of whole milk or skim is added. The sweet whey is heated to 200° F. The coagulated albumin rises to the surface and is dipped with a ladle. It is drained, pressed and salted. It is usually eaten fresh. The yield is about 10%.

Riesengebirge—A soft rennet cheese made from goats' milk in the northern mountains of Bohemia. About 18 lb of cheese are obtained per 100 lb of milk.

Rindless Cheddar—(See Rindless Cheese)

Rindless, (natural)—Rindless loaf cheese is natural (not processed) cheese that is packaged and marketed in a transparent flexible wrapper. Much Cheddar, Brick and Swiss are now put up in this manner. There is no rind formation on such cheese and drying losses are small. This type of cheese may be packaged by manufacturer, wholesaler or by the retailer either before or after it is cured.

Rindless Swiss—Cheese is wrapped and cured in a flexible stretchable film. This process is slightly different from the cheddar process (see Rindless Cheese) in that the cheese is wrapped after it has been salted in the brine tank. A stretchable film must be used to allow for the normal production of gas when in the warm room.

Rinnen—A sour milk cheese which was known as early as the 18th century. It is made in Pomerania, Poland and derives its name from the wooden trough in which it is laid to drain. Caraway seed is usually added in its manufacture.

Riola—A soft textured and strongly flavored cheese usually made from sheep's or goats' milk. It is made similar to Mont d'Or cheese but is ripened for 2 to 3 months.

Robbiole—A soft, rich, fast ripening Crescenza like cheese made in the Italian Alps. The cheese is made from whole or partly skimmed milk. The milk is set, cut and placed in 8 inch diameter forms. After forming the cheese is drained for 23 days and dry salted and left to ripen for 12 to

days. **Robbiolini**—A soft Crescenza like cheese made in Lombardy, Italy. The milk used may be cows' or a mixture of cows' ewes' or goats' milk. About 10% acid whey is added to the milk before setting. After 21 hours the curd is cut into slices and kneaded into small rolls. Salt is added during the kneading.

Rocamadour—A soft 2 ounce cheese made from ewes' milk in Southern France. The rennet coagulated curd is dipped into terra cotta forms, the whey is drained and the curd is salted.

Roll—A hard rennet cheese made in England from whole cows' milk. It is cylindrical in shape, 9 inches in diameter, 8 inches high and weighs 20 lb.

Rollot—A soft rennet cheese similar to Camembert, 2½ inches in diameter and 2 inches thick, made in the Departments of Somme and Oise, France.

Romadour—A cheese similar to Limburger made in southern Bavaria from sheep's and goats' or cows' milk. It is 4½ x 2 x 2 inches in size and weighs about 1 lb. It is said to be a little finer variety than Limburger and to sell for a slightly higher price. The cheese is cured a shorter time and with less surface smear than Limburger. It is also called Remoudou and Romatur.

Romanello, (little Romans)—A hard grating cheese made similar to Romano except that the curd is placed in a wicker basket to drain the imprint of the woven basket remaining on its surface. It is about 9 inches in diameter, 5 inches high and weighs from 9 to 12 lb.

Romano—A popular very hard cheese of Italian origin which is used for grating. A 2% fat milk raw or pasteurized is warmed to 88-90° F and culture is added. The culture consists of *Streptococcus thermophilus* and *Lactobacillus bulgaricus* which should have an acidity of 1.2-1.3%. The milk is ripened for 10 minutes before the addition of rennet. Traditionally a rennet paste was used but now rennet plus a lipolytic enzyme may be added, both at the rate of 3 oz. per 1000 lb milk. The coagulated curd is cut with ¾" knives and is cooked in one half an hour to 116-118° F. The curd is stirred for 20 minutes after which one half of the whey is removed. Stirring is continued until the acidity has increased about .04%. The whey is drained and the curd is salted at the rate of 2%. The salted curd is then pressed. After pressing the cheese is usu-

ally brine salted for about 36 hours. The cheese is removed and cured at 50-60° F. This cheese is cylindrical in shape, 10 inches in diameter, 6 inches thick and weigh between 15-20 lb. and may be colored black on the surface. Analysis—Federal Standards—Moisture, not more than 31%; Fat, not less than 38% in the solids.

Romatur—See Cheese, Romadour.

✓ **Roquefort**—A semi-soft to hard, rennet cheese made in southern France from sheep's milk and mold-ripened in caves from one to five months in order to develop a characteristic green mold throughout the center of the cheese. The Roquefort type now made in the United States from cow's milk is ripened in refrigerators under controlled temperature and humidity and is known as Blue cheese. In appearance the cheese is white with a crumbly body streaked with green mold and possesses a rather sharp, spicy, "piquant" flavor. Federal Standards—Moisture, not more than 45%. Fat, not less than 50% in the solids.

Royal Brabant—A small, Limburger-type cheese made from cow's whole milk in Belgium.

Runesten—A Danish, Swiss-type cheese which resembles Herrgårdstost. The 5 lb. wheels have smaller eyes than Swiss. This cheese is also made in Minnesota and Wyoming.

Saanen—A type of Emmentaler cheese made in Switzerland from cows' milk. It has been made since the 16th century and is now exported in limited amounts. It sells for a higher price than the regular Emmentaler, but the process of manufacture is identical with that of Emmentaler, except that it is cooked much drier, takes longer to cure, and keeps longer, and the eyes are few and small. Each cheese weighs from 10 to 20 lb. A cheese is often made at the birth of a child and portions are eaten on feast days during his life and at his burial.

✓ **Sage**—A cheese made by the ordinary Cheddar or stirred curd process and of any of the various shapes and sizes in which that cheese is pressed. Inside, it has a green mottled appearance. The flavor of sage is usually obtained from sage extract, and the green mottles are produced by cutting succulent green corn fine and pressing the juice out.

St. Benoit—A soft, rennet cheese similar to Olivet, made in the Department of Loiret, France. Charcoal is added to the salt which

is applied to the exterior of the cheese. Ripening requires from 12 to 20 days, depending upon the season. Each cheese is about 6 inches in diameter.

St. Claude—A small square cheese made around Saint Claude, France, from goats' milk. Each cheese weighs between ¼ and ½ lb.

St. Marcellin—A goats' milk cheese made in Isère, France. It is about 3 inches in diameter, ¾ inch thick, and weighs about ¼ lb. The cheese making procedure is similar to that of Brie. Blue mold is cultivated on the surface only.

St. Remy—A soft, rennet cheese quite similar to Pont l'Évêque. It is made in Haute-Saône, France.

St. Stephano—A Bel Paese-type cheese made in Germany from whole milk.

St. Wel—A cheese made in England similar to a cheese made in the United States called Yogurt. Cultures of *Bacillus bulgaricus* are used to develop acidity in the milk.

Salamana—A soft sheep's milk cheese made in southern Europe, eaten as a spread on bread or mixed with corn meal and cooked. It is filled into bladders and allowed to ripen. It has a very pronounced flavor.

Salame, (Italian sausage type)—A Provolone cheese made in large sausage shaped forms. Formaggio Salame and Stracchino Salame refer to soft cheese of the Bel Paese-type.

Saloio—A hard cheese made in the farming district around Lisbon, Portugal, from cows' skim milk. It is cylindrically shaped, measuring 1½ or 2 inches in diameter, and weighing about 4 ounces.

Saltless—Cheese to which no sodium chloride (common salt) has been added. Also the name applied to a cheese which contains no sodium chloride but contains potassium and ammonium chlorides. This is a cheese made for dietetic purposes.

✓ **Samsoc**—A Danish cheese weighing 30 lb. and 17 inches in diameter. It has a small amount of uniform (3/16") eye formation. The curd is drained, brine-salted and cured at 60-70° F. for 3-5 weeks to produce the desired eye formation. Then curing is completed at lower temperatures.

Sandwich Nut—A cheese made by mixing chopped nuts with Cream or Irish Neuf-châtel cheese.

Sandy Process—See Gritty Process Cheese

Sapsago—A cheese made principally in Glarus, Switzerland, from the skim milk of cows. It is also known as Schabzieger Glasnerkäse, Grunerkäse, and Krüterkäse. It is said to have been made as early as the 13th century. This small, hard, green cheese is flavored with the leaves of a species of aromatic clover, and is shaped like a truncated cone, 4 inches high, 3 inches in diameter at the base and 2 inches at the top. It is imported to some extent to the United States. Federal Standards—Moisture, not more than 35% for that imported into the U. S.; Fat, 5 to 94%.

Sardo, (Sardo Romano)—A grating Romano-type cheese made on the island of Sardinia from cow's and ewe's milk. Pecorino Sardo is made solely from ewe's milk. Sardo made also in U. S. and Argentina.

Sarrasin—A Roquefort-type cheese made in southwestern Switzerland.

Sassenage—A hard, rennet, blue veined cheese about 3 inches thick and 12 inches in diameter, made from cows' milk to which small quantities of goats' and sheep's milk are usually added. It is nearly identical with Gex and Septimonce, and derives its name from the village of Sassenage, near Grenoble, France. It requires about 2 months to ripen.

Scanno—A sheep's milk cheese, made in Abruzzi, Italy. The rennet curd is collected in a linen cloth and dipped in a 0.25% solution of iron oxide in sulfuric acid. The curd is left in this solution for 21 hours. The outside of the cheese is black, with a deep yellow interior. It has a buttery consistency, a burnt taste, and is eaten usually with fruits.

Scamorze or Scamorze—A small, soft, mild Pasta Filata type of cheese first made from buffaloes' milk in southern Italy. Now also made from cows' milk. It is made similarly to Caciocavallo except that it is not cured. The cheese is formed into an oval shape with an indentation and lappets at the top for handling.

Schabzieger—See Cheese, Sapsago

Schamser, (Rheinwald)—A runner cheese made in the Canton of Graubünden, Switzerland, from the skim milk of cows. Each cheese weighs from 40 to 45 lb and is 18 inches in diameter and 5 inches thick.

Schlesische Sauermilchkäse—Hand cheeses of Silesia which are dried on straw-covered shelves until they are very hard. The cheeses are cured for 5-8 weeks. While curing they are washed with warm water every few days. (See Hand cheese)

Schlow—A Limburger type cheese made in northern Austria similar to Romadur. It is a soft-cured, rennet cheese 4 x 2 x 2 inches in size. It is wrapped in tin foil for marketing, and is also known as Schlowkäse or Castle cheese.

Schottengied—A whey cheese made for home consumption by the peasants of the Alps.

Schütrenkäse—A unloaf wrapped, Romadur type cheese made in Austria.

Schwarzenberger—A Limburger-type part skim, rennet cheese made in southern Bohemia and western Hungary. During the 2 or 3 months ripening period it is washed daily with salt water. The cubes of cheese weigh approximately one lb.

Sénécesterre—A soft rennet cheese originating at St. Nectaire in the Department of Puy-de-Dôme, France. It is made of whole milk, is cylindrical in shape, and weighs about 1½ lb.

Septimonce Cheese, (Tura Bleu)—A hard blue-mold rennet cheese made from cows' milk plus a little goats' milk. It is similar to Gex and Sassenage, and its manufacture is nearly identical with that of Roquefort. It is made almost exclusively on isolated farms, rather than in cooperative dairies, in the Department of Jura, France.

Serbian—A rennet cheese made by warming the milk in a kettle over a fire or in a tub by immersing hot stones. After the rennet is added, the milk is allowed to stand 1 hour, when the curd is lifted in a cloth and the whey allowed to drain. It is then placed in a wooden vessel, salted, and covered with whey for 8 days or so, and with milk for about 6 days.

Serra da Estrella—This is the most highly prized of the Portuguese cheeses. The name is derived from the mountainous region where it is produced. It is a soft goats' and ewe's milk cheese with a pleasant, acid taste. A similar cheese, made in another part of Portugal is called Castello Branco. Usually the milk is coagulated with the flower extract of a thistle.

Silesian—A cheese made from cows' skim milk, known as *Schlesischer Weichquarg*, made similar to a Hand cheese. Flavoring substances, such as onions or caraway seed, may be added. It is eaten while fresh.

Singles—See Cheese, Flats.

Siraz—A Serbian semi-soft mellow cheese made from whole milk. It is smooth and has no holes. The small flat cakes are sun dried after which they are salted and placed in wooden containers to ripen.

Sir Iz Mjesine—A cheese made in Yugoslavia from sheep's skim milk. After being dried for a day it is cut into cubes, salted, and packed into fresh sheep or goat hides for curing.

Sir Mastny—A rennet cheese made in Montenegro, Yugoslavia from sheep's milk. The curd is cut coarse and then heated to 100° F., drained and molded.

Sir Potny, (Tord, Mtsav)—A rennet cheese made in Montenegro, Yugoslavia from the skim milk of sheep. It is cut coarse, heated to 100° F., drained and molded.

Skanausia Suria (Michigan Farm Cheese)—A soft Lithuanian cheese made from partly skimmed milk. The curd is pressed in bags and is marketed in one to two weeks. This cheese is made in Michigan and Wisconsin. See Farm Cheese.

Slip—Clabbered milk, before separation of curds and whey.

Slipcase—A soft, unripened rennet cheese made from cow's milk in Rutlandshire, England. It is an old variety, having been well known in the middle of the 19th century. When ripe the surface loosens and has a tendency to slip off. The cheese is ripened between leaves of cabbage for 3 days to a week after which it is ready to eat.

Smoked—Usually American-type or Cheddar which has the flavor and aroma of smoke. This flavor may be obtained from (1) a chemical liquid smoke added to the milk or curd (2) a so-called smoked salt may be used for salting (3) cheeses may be hung on racks and smoked like meat, preferably by use of hickory wood smoke. Only good quality cheese should be smoked. Some *Pasta Filata* type cheeses are smoked as are also some Process cheese, cheese foods and spreads.

Soaked Curd, (Washed Curd Cheese)—This is a modification of the Cheddar process which results in a milk Cheddar. Cheddar cheese, after milling, is covered with cold water for a period of 5 to 30 minutes. This results in a high moisture, quick ripening, soft-bodied, open textured cheese. Analysis: Moisture, not more than 42%; Fat, not less than 50% in the dry matter.

Soft—A class of cheese characterized by a soft physical appearance as contrasted with the hard cheese such as Cheddar, etc. Some of the more common soft cheeses are Cottage, Cream, Neufchatel, Limburger and Camembert.

Spalen, Shrinza, Shrinz, (Argentina)—An Emmentaler-type cheese sometimes known as *Stringer*. It is made largely in the Canton of Unterwalden, Switzerland, the name being derived from the vessel in which the cheese is transported and in which 5 or 6 of them are packed. Each cheese weighs from 35 to 40 lb.. It is a very hard cheese with a grainy texture and a sharp nutty flavor with small eyes if any. When fully cured it is used as a grating cheese.

Sperrkäse (Trockenkäse)—See Dry Cheese.

Spiced—Cheese flavored with spices such as anise, caraway, cloves, cumin, pepper and sage. Sometimes an oil extract of a spice is added to impart the flavor. The cheese is usually of the hard type, the spice added with the salt.

Spiced cheese is made in many countries, but is especially popular in Scandinavia under such names as *Kumin* or *Kommenost*, *Noekkelost*, *Christian IX* (Denmark), *Friesian Clove*, *Pepato*, *Sage*, and *Bondost* (Swedish) which is also made in Wisconsin.

U. S. Federal definitions and standards for spiced cheese specify that it must either be made from pasteurized milk or be cured for not less than 60 days at a temperature not lower than 35° F.; that it must contain not less than 1½ ounces of spice per 100 lb. of cheese; and that if it is made from whole milk it must contain not less than 50% of fat in the solids, and if it is made from partly skimmed milk not less than 20% of fat in the solids.

Spitz—A small, rennet cheese made from cows' milk. It is cylindrical in shape, 4 inches high, and 1½ inches in diameter.

Spitzkäse—A small, spiced, Limburger-type cheese made in Germany from cow's milk. Similar to Backsteiner as to the making procedure, except that caraway seed is added to the curd.

CHEESE, NAMES AND DESCRIPTIONS

Square—A rectangular-shaped variety of Cheddar cheese about $\frac{3}{4}$ inch thick and made in various sizes

State Brand—A cheese which meets the grading standards of the state is known as a state brand cheese

Steinbuscher—A soft cheese made first in Steinbusch Germany about 1860. The cheese has a yellow surface and a buttery consistency and is similar to Romadur

The milk is set, the curd is cut, cooked and dipped into Limburger type forms. The cheese is dry salted and placed in a humid curing room during which time a white mold develops on the surface. After sufficient mold growth, the cheese is rubbed dry and wrapped in parchment

Steppes—A Russian cheese made from whole milk. It is about $10 \times 5\frac{1}{2} \times 7$ inches in size. It is a rich mellow cheese with a Tilsiter-like flavor and with small regular eyes

Sutton—A hard, mild, blue-veined cows milk cheese. An English cheese first made in Leicestershire, England and thought to be the finest English cheese. It is rich and mellow, and has a piquant flavor milder than Roquefort. The cheese has veins of blue mold throughout the interior and a wrinkled rind resulting from molds and bacteria that grow on the surface. The open flaky texture provides aeration for *Penicillium roqueforti*, so the cheese does not have to be pierced. The cheese measures about 8 inches in diameter and weighs 12 to 15 lb.

Stured Curd—The first type of American cheese made in the U. S. The methods for making as now generally followed are identical with those for Cheddar, with the exception that the curd is kept in the whey longer, is not milled after dipping, but is kept granular by use of forking agitators. This cheese is usually open textured and has slightly less moisture than Cheddar, otherwise they are indistinguishable.

Storage—Aged cheese. A processing cheese classification referring to a cheese aged over 6 months.

Stracchino—A generic name applied to several forms of soft, whole milk, Italian cheese such as Stracchino de Milano, Fresco, Quardo, Quartuola, Crescenza, Salame or Formaggio Salame. These are defined separately.

Strangenkase—A German, Limburger type cheese similar to Backsteiner made from partly skimmed milk.

Stringer—See Cheese, Spalen

Syrna—A cylindrical-shaped cheese made in Syrna Austria from the whole milk of cows.

Surati, Panir—A buffalo's milk cheese made in India. It was first made in Surat of Bombay Province. The curd is placed in bamboo baskets lined with salt in drain. The cheese is kept in whey while curing. It is also shipped in whey in large earthen ware containers.

Sveciaost—A Swedish cows milk cheese made for domestic consumption from whole or skim milk. The cheese is made in much the same way as Gouda and resembles Gouda except that it has a more open texture.

Sweet Curd—A hard rennet cheese, which closely resembles Cheddar cheese. Cows milk is set while it is sweet. Cutting of the curd and cooking are done rapidly without regard to development of acidity and the cheese is put in press immediately.

Sweet Curd Cheddar Cheese is considered a defective cheese. Easily subject to spoilage by organisms which usually are suppressed by larger amount of acid. On the other hand Gouda and Edam are also typed as sweet curd cheese, but in this case no inferior cheese is implied.

Sweet Curd Cottage—Made in large flakes is also known as low acid, rennet type, or flake-type Cottage cheese.

Swiss, Emmentaler—A hard, rennet cheese originated in the Emmental Valley in the Canton of Berne, Switzerland. It was introduced into the United States by Swiss immigrants about 1870 and now ranks second only to Cheddar in quantity produced here where it is often spoken of as *Schweizer*. The chief characteristics of Swiss cheese are its creamy yellow color, its solid compact slightly translucent body with shiny holes or "eyes" which develop as the cheese ripens and its peculiar mild and sweet nutlike flavor. It is traditionally made in large, steam heated, copper kettles, each of which may hold 3,000 lb or more of milk. One cheese is made from each kettle. A cheese weighing about 185-210 lb can be made from 2,000 lb of milk. The making of Swiss cheese is a complicated process which requires not only special factory equipment but the "know how" of a skilled cheese maker. See Swiss Cheese in Handbook P. 155.

Switzer, (American Swiss, Swiss, Emmentaler)—See Swiss Cheese.

Taffelost—A short-flavored, whey cheese resembling Mysost.

Tafi—A cheese manufactured in the Province of Tucuman, Argentina.

Taleggio—A soft, surface-ripened, Stracchino (whole milk) cheese first made in Taleggio Valley, Lombardy, Italy. The cheese, 8 inches square and 2 inches thick has a moldy rind and is cured for two months.

Tali—See Cheese, Eriwaui.

Tamié—A whole milk, rennet cheese made by the Trappists in Savoy, France. The method of manufacture is, to a large extent, a trade secret. Similar to Tome de Beaumont.

Tanzenberger—A Limburger-type cheese of Carinthia, Austria.

Teleme—A so-called pickled cheese made in Rumania, Bulgaria, Greece and Turkey, from sheep's or goat's milk; sometimes known as Branza de Braila. It is cured for 8-10 days either in dilute salt brine or packed between layers of salt. The cheese, which is marketed in 8-10 days, is white and creamy.

Telpanir—See Cheese, Tschil.

Terzolo—The Italian term used to differentiate between Grana type cheese made in winter and Maggeugo (April to September) and Quartirolo (September to November).

Tete de Maure—See Cheese, Edam.

Texel—A cheese made on the island of Texel, Netherlands from sheep's milk. Each cheese weighs about 3 or 4 lb.

Thenay—A soft, whole-milk cheese resembling Camembert and Vendôme, made around Thenay, France. It is of comparatively recent origin and its consumption is limited practically to the region where it is produced. It is about 5 inches in diameter and 4 inches in height. The cheese is placed in well ventilated rooms for 20 days during which time it becomes covered with mold. The mold is removed and the cheese is cured for another 15 days.

Three-quarter Fat—Cheese made with three quarters whole milk and one quarter skim-milk.

Tibet—A hard grating cheese made in Tibet. The small cheese is made in hard cubes of about 2 inches and is strung 50 to 100 on a string to dry and cure.

Tignard—A hard, blue-veined cheese resembling Gex and Sassenage, made from sheep's or goats' milk in the valley of Tigne in Savoy, France.

Tilsit, (Tilsiter), Ragnit—A hard, rennet cheese made in East Prussia from the whole milk of cows. The cheese is from 6 to 12 inches in diameter, 3 to 4½ inches in height, and weighs from 6 to 28 lb. It is a medium-firm, slightly yellow cheese, similar to Brick, with mechanical openings and in some cases round eyes and has a medium to sharp piquant flavor similar to a mild Limburger. Sometimes caraway is added.

Tome de Beaumont—A French cheese made from cow's whole milk. The fine-cut curd is placed in cloth lined molds 7 inches in diameter and is pressed for 6-8 hours. The cheese is salted and cured for 5-6 weeks.

Topfen—A sour-milk cheese made in Germany from skim milk and eaten while fresh. It is put up in small packages weighing about 1 ounce.

Topfkase—A sour-milk, cooked-curd cheese of Germany similar to Topfen. The beated curd is poured into earthen pots (topfe), hence the name. See Cooked Cheese.

Tord—See Cheese, Sir Posny.

Toscanello—A hard, grating, ewe's milk cheese of Tuscany, Italy.

Toscano, Sardo, Incanestrato—A Romano-type cheese made in the U. S. Incanestrato (in-a-basket) when molded in wicker baskets which leave their imprint on the cheese. See Sardo and Romano.

Touareg—A skim-milk cheese made by the Berber tribes, from the Barbary States to Lake Chad in Africa. It is a very hard, dry, un-salted cheese. To curdle the milk, some of the natives use the leaves of a Korouren tree.

Touloumisio—A Greek, Feta-like, cheese made in skin bags. The drained, salted curd is placed in wooden barrels until firm, then washed thoroughly and cut into small pieces, which are put in skin bags and covered with milk or whey to cure. During curing the bags are opened to permit the gas, formed by fermentation, to escape.

Trappist—A mild semi-soft, whole-milk cheese originating with the Trappists in 1880 in a monastery near Banja Luka in Yugoslavia. It is pale yellow in color and is mild in flavor. The cheese is exported in large quantities to Austria and Hungary. Similar to the Port du Salut of France and the Oka cheese of Canada.

Travnik Arnautski Sir, Arnauten—A soft rennet cheese usually made from sheep's milk to which a small amount of goat's milk has been added. It originated in Albania in northwestern Turkey in Europe and has been made for over a century. The curd is put in woolen sacks for whey drainage, then removed and band pressed into flattened balls and air dried. It is then packed in kegs. This soft white mild cheese may be eaten fresh or kept for several months.

Treccia—A small braided Pasta Filata cheese eaten fresh. See Caciocavallo.

Triplets—Daisy-size Cheddar cheese when packed three in a box are called triplets.

Trockenkäse (Sperrkäse)—Same as Dry Cheese.

Trouville—A soft ripened cheese very similar to and made in the same locality as Pont l'Évêque.

Troyes—Refers to two different kinds of cheese of the Camembert type made near Troyes, France. See Ery and Barberey.

Truckle Cheddar, (Stilton)—The English terminology for a small style of Cheddar of 10-12 lb although it may be as small as 5 lb.

Tschil (Leaf Telpanis Zwirn)—A skim milk cheese made in Armenia from the milk of cows or sheep for which the curd is kneaded by hand and the cakes are packed in skins.

Tuna—A Mexican cheese which has been of local importance from an early date. It is really a confection rather than a cheese being made from the fruit of the *Tuna cardona* to which nuts and flavors are added. It is chocolate in color, wholesome and pleasant to the taste. It will keep for a long time.

Twdr Sir—A Serbian skim milk cheese made from sheep's milk and set with rennet at about 104° F. The curd is cut and is lifted from the whey with a cloth, salted lightly and pressed in forms 10 to 12 inches in diameter and 2 inches high. This cheese has small holes, a sharp flavor and is similar to Brick but contains less fat.

Twinn—A cylindrical style of Cheddar cheese 5" high x 14½" diameter and weighing 30-37 lb generally packed two in a package. See Flats.

Twozog—A sour milk cheese made in Russia. The sour roll is kept in a warm place for 24 hours after which the whey is removed and the curd put into wooden forms and pressed. This cheese is used in making a bread called "Notruschki."

Unsalted—Cheese may be unsalted if it is to be used for processing. Such cheese however breaks down rapidly and usually develops off flavors.

Uri—A hard rennet cows milk cheese made in Uri, Switzerland. It has a diameter of from 8 to 12 inches, is 8 inches high and weighs from 20 to 40 lb.

Unseren (Osera)—A mild flavored cheese made in Switzerland.

Vachern—This name applies to several kinds of cheese. One type known as Vacherin à la Main made in Switzerland and in France has a firm hard rind but the interior is almost liquid in consistency. Another type known as Vacherin Fondu is made in much the same manner as Emmentaler. The ripened cheese is then melted and spices are added.

Västerbottensost—A cheese made in the Province of Västerbotten in northern Sweden similar to Västgötsost except that the curd is stirred for a longer time after it is heated which results in a firmer cheese.

Västgötsost—A Herrgårdstost type cheese made in Västergötland, Sweden. The making procedure is similar to Herrgårdstost except that the curd is broken up after the whey is removed from the heated curd. This results in irregular mechanical openings instead of the customary eyes. See Herrgårdstost.

Vendôme—A soft ripened cheese resembling Camembert and Thenay made in the region of Vendôme, France. The cheese is cured in cool moist cellars and sometimes buried in ashes. The principal market is Paris.

Veneto Venezia—A hard grating Grana type cheese which is similar to Asiago. The cheese has a sharp flavor and lacks eyes. See Parmesan.

Villiers—A square soft rennet cheese weighing about 1 lb made in the Department of Haute-Marne, France.

Vize—A hard, grating, ewe's milk cheese similar to Romano, made in Greece.

Vlasic—See Cheese, Travnik.

Void—A soft, rennet cheese similar to Limburger and Pont l'Évêque. It is made in the Department of Meuse, France.

Vorarlberg—A sour-milk cheese made from cow's milk. It is essentially a hard cheese, semi-circular in shape and varied in size. When ripe the cheese is greasy and has a very strong odor and flavor.

Warwickshire—An English cheese similar to Derby.

Washed Curd Cheddar—See Soaked Curd Cheese.

Weissacker—A Bavarian, white, smeary, soft, cow's milk cheese similar to Limburger and Backsteiner with a lustrous surface. The curd is handled in the same way as Limburger except that the larger cubes of curd are not so well drained.

Wensleydale—A medium hard, blue-veined, cow's milk cheese made in Wensleydale, Yorkshire, England. Similar to Stilton except that the melon-like outward appearance of Stilton is lacking. The cheese is white with blue veins and has a firm, smooth body, a rich creamy flavor, stronger than Stilton.

Werder, (Elbinger, Niederungskäse)—A semi-soft, cow's milk cheese made in West Prussia. This Gouda-shaped cheese is ripened initially by a white surface mold and later by bacteria which produce a red color on the surface. Werder is ripened the same way as Tilsiter but is softer and not as sharp. The cheese is dry salted, and is cured for a month at 60° F. during which time the white mold grows; then curing is completed at 50° F. The cheese is ripened in 10 weeks.

West Friesian—A rennet cheese made from the cow's skim milk. The milk is coagulated in a copper kettle, in one hour. The curd is broken up, kneaded in a wooden tub and salted after several hours. It is pressed for 3 hours, washed in hot water, wrapped in a fine cloth and again pressed for 12 hours. The cheese may be eaten when 1 week old.

Westphalia Sour Milk—A Hand cheese made in Westphalia, Germany. The sour milk is stirred while heating to 100° F.; curd is placed in a sack; salt, butter and caraway seed or pepper are added. It is then molded by hand, dried for a few hours, and ripened in a cool cellar.

Whey—Made from whey in which the albumin has not been coagulated. The whey is either concentrated by boiling and then cooling or the albumin is coagulated with heat and acid, and skimmed off. Some whey cheeses are known as Mysost, Primost, Ricotta, and Ziger, described elsewhere.

White, (Fromage Blanc)—A skim-milk cheese made in France during the summer months. It is consumed while fresh, and may or may not be salted.

Wilstermarsch, (Holsteiner Marsch)—A cow's milk cheese similar to Tilsiter made in Schleswig-Holstein, Germany. This cheese is classed as follows: *Rahm*—a whole milk cheese with added cream. *Sussmilk*—a whole milk cheese. *Zweizeitige*—a cheese made with a mixture of morning whole milk and evening skim milk. *Dreizeitige*—a cheese made from 12 and 24 hour old skim milk and fresh whole milk. *Herbst*—a cheese made from a mixture of 12, 24, 36 and 48 hour old skim milk and fresh whole milk. The milk is set in a copper kettle, rennet added and heated to 82-86° F. Curd is cut with a scoop or ladle and some of the whey is removed. The curd is transferred to a cloth-lined type of curd sink where it is mixed and squeezed until firm. Salt is added, and the curd kneaded by hand and then transferred to cloth-lined, Tilsiter-like molds to be pressed heavily for 8-12 hours. After forms are removed this soft cheese may be bandaged to control flattening. The cheese is turned daily for a week or more, then curing is completed in a dry room. It is ready for market in 3 to 4 weeks.

Wiltshire, (Truckles)—A hard, sweet-curd cheese similar to Derby, first made in Wiltshire, England.

The milled, salted curd is pressed over night in a press vat. The following day the cheese is removed from the press, salted on the surface, dressed in cloth and pressed again. This process may be repeated once or twice after which the cheese is pressed for a week. The cheese is cured the same way as Derby. See Derby.

Withania—Cheese so called because the rennet used in making it comes from withania berries (*W. coagulans* a member of *Solanaceae* family). Cheese made from withania rennet is said to have a good flavor if ripened to the right degree, but with age it develops an acid flavor. It is made in East Indies where religion and prejudice make the use of animal rennet impracticable.

Yoghurt and Acidophilus—Cheeses made with cultures of *Streptococcus thermophilus* *Thermobacterium bulgaricum* and *Th. yoghurt* is named Yoghurt and that made with *S. thermophilus* and *Th. acidophilum* is named Acidophilus cheese. The cheeses are made much the same as cream Brie Coulommiers and Camembert or Gouda except that the above special starters are used. They are made in Mediterranean countries from ewes milk and in Quebec Canada from cows milk.

In Quebec the pasteurized milk is coagulated with starter drained in bags salted and packaged. It has a sharp acid flavor a consistency of fine grained Cottage and keeps well.

Yorkshire Stilton—See Cheese Cotherstone

Young American, Y.A.'s, Yams—A cylindrical shaped style of Cheddar cheese approximately 7 inches in diameter 7 inches in height and 8 to 12 lb in weight.

Yu Pink—A Chinese term for cheese or milk cake.

Ziegel Cheese—Made in Austria from either whole milk or whole milk to which 15% of cream has been added. It is about 3 x 2 x 2½ inches in size and ½ lb in weight. It is ready for market after about 8 weeks.

Ziger Schottenziger Albumin—A German whey protein cheese made by coagulating the albumin with heat and acid then skimming it off the hot curd, cooling and draining it on cheesecloth and pressing it in a Swiss cheese press for 24 hours. Then it is placed in a salt bath to which cider or vinegar is sometimes added. In the U.S. it is called Ricotta. See Ricotta.

Zomma—A Turkish plastic-curd Casocav allo-type cheese similar to Katschkawalj. Contains at least 30% fat.

Zwirn—See Cheese Tschil

(EDITOR'S NOTE—U.S.D.A. Handbook #54 has been freely used as a reference for detailed description and names of Cheese)

CHEESE TERMS

Acidification—The process of acidifying as in adding acidifying agents in the making of Process Cheese.

Acidifying Agents—Acids which may be one or a mixture of two or more of the following: lactic acid, citric acid, acetic acid and phosphoric acid. They may be used to lower the pH of the pasteurized Process Cheese as long as the pH is not below 5.0.

Acidity Measurements of Cheese and Curd—These can be made by any of the following methods: Titratable acidity test, Hot iron test for curd acidity, pH determination of cheese. For details see Dairy tests.

Acidity, Titratable, Determination of, in Cream Cheese—See Dairy tests.

Agitators—The paddles which are used to stir the milk and curd in a vat during the cheesemaking process. Usually made of metal and operated mechanically.

American Cheese (Cheddar), Commercial Styles of—(See 1100p size)

Style	Diam in	Ht in	Wt lb	No per box
Cheddar	14½	12	65-66	1
Flats (single or 1/2 n)	14½	5½	30-33	1 or 2
Danish (single double or triple)	13½	4	20-25	1 2 or 3
Young Americas	7	7	10-11	4
Long Horns	4	12	12-15	4

American Knives in Cheesemaking—The term formerly applied to wire knives used in the U.S., as contrasted to the English cheese breaker for cutting curd.

Baffle Boards, Brakes—Metal baffles placed at right angles to the flow of the curd and whey in circular kettles which aid in uniform and thorough mixing of the curd and whey during cooking.

Ball Compressor, (English) John Bull Indicator—A device used to measure the body of cheese. This device is placed on the top of the cheese and the resistance to pressure is measured on a gauge.

Bandager, (Canadian)—A device for holding the bandage prior to placing cheese in the hoop.

Banding—Strapping and fastening boxed cheeses with wire or metal bands.

Basket Surrer—A device made up of wires on a handle for manually stirring curd and whey.

Blackout, in cheesemaking—Stoppage of acid production due to bacteriophage.

Bleaching Milk for Cheesemaking—To ensure a white curd with blue-mold cheese the cream may be treated with *benzoyl peroxide* which should not exceed — 0.002% of the weight of the milk. This bleaching destroys Vitamin A.

Blending—The process of blending cheese of varying ages and body breakdown to achieve the desired finished product in Process Cheese.

Bloom—An English term which refers to the general overall conditions of finish, appearance and color of a cheese.

Blue Cheese Flavor—This is thought to be associated with the caproic, caprylic and capric acids and their esters and methyl ketones.

Blue Coating—A skim milk cheese must be coated with a blue-colored paraffin or other tightly adhering coating colored blue, according to the Food, Drug and Cosmetic Act.

Bluing Process—Development of blue mold on Stilton cheese is somewhat similar to that used for Blue Mold cheese. The blue mold grows best in rooms containing much carbon dioxide and little oxygen. For more details see good books on Cheesemaking.

Body Cheese—A term applied to a natural cheese which imparts the desired characteristics to Process cheese.

Bound Water, In Cheese—The water in cheese which is tied up with the protein of cheese. This amount of water has been reported as 0.2-0.35 grams per gram of cheese. This bound water has been measured by the freezing point depression technique based on the assumption that part of the water molecules appear to be unable to act as a solvent for substances which cause a freezing point depression. Bound water cannot be determined accurately by any known method. The amount of bound water in cheese is affected by the amounts of fat, solids and sodium chloride and also by the pH of the cheese.

Boxes, Brick Cheese, (American style)—

Daisy Brick boxes—14 in. in diameter and 4½ in. high.

Brick Flat boxes—15 in. in diameter and 6½ in. high.

Boxes for Brick and Limburger Cheese, (Size of)—

<i>Brick Cheese Boxes</i>	<i>Outside length of box</i>	<i>Inside width of box</i>	<i>Inside depth of box</i>
<i>Style of box</i>			
Full size	32 in.	21 in.	5½ in.
Half size	32 in.	10½ in.	5½ in.
Quarter size	18 in.	10½ in.	5½ in.
<i>Limburger Cheese Boxes</i>			
Full size	32 in.	22 in.	5½ in.

Boxes, Federal Type B Square Wood Export (Cheese)—

Cheddar and Twin styles (Inside) 15 x 15 x 12 inches.

Triple Daisy and Triplet styles 14 x 14 x 12¼ inches.

Boxes for Cheese (Wisconsin Standards)

<i>CYLINDRICAL BOXES</i>	<i>Diameter</i>	<i>Height</i>
Single Daisy	14 in.	4½ in.
Double Daisy	14 in.	8½ in.
Longhorns (4 per box)	14½ in.	13¼ in.
Young American (4 per box)	17 in.	8¼ in.
Flats	15 in.	6¼ in.
Commodores Midgets Junior Twins Cheddar twins	10¼ in.	4½ in.
	15 in.	12 in.

Brake or Breaker—In Swiss Cheese making, an apparatus clamped on the inside of the kettle or vat. It throws the moving curd from the side to the center of the kettle.

Branding—Lettering or placing on the cheese a code consisting of the day of manufacture, month, year, factory registration number and vat number.

Breaker—English term for curd cutter.

Brine Cloth—A cloth soaked in brine which is used to wash cheese on the shelves during curing.

Brine—A sodium chloride solution. Swiss, Brick, etc. are placed in a 22% brine for salting. The cheeses are left in this brine until the desired salt is diffused into the cheese.

Brine Salting—See Brine.

Brining—The act of placing cheese in a sodium chloride solution for salting.

Calcium Chloride Addition—A maximum of 0.02% of Calcium Chloride may be added to milk for cheesemaking. It is usually added to restore the curd properties after pasteurization of the milk.

Call Boards—An early system of cheese marketing which was brought into popular use just prior to 1900 at Plymouth Wisconsin forerunner of the Wisconsin Cheese Exchange leading Cheese Exchange in U S

Names of salesmen for the various factories with the styles and grades of cheese were entered on a blackboard The secretary recorded such offers to sell by volume under the salesman's name with no price stated Bids were entered opposite offerings and sales were made to the highest bidder Offers and bids were termed calls hence the name call boards

Candle Plug—A desirable plug removed from a Cheddar cheese by means of a trier free from holes and which exhibits a slight translucence similar to a candle—hence candle plug

Cap Cloths—Muslin cloths placed on the top and bottom of cheese during pressing These cloths aid in whey removal and in closing up the surface of the cheese They are removed and washed and sterilized after pressing

Capalase—The trade name for a lipolytic enzyme from a goat It is used in making Italian cheese See Italase

Casein/Fat Ratio—The proportions of casein and fat in milk are often stated in terms of pounds of casein per pound of fat This ratio is used to predict fairly accurately the proportions of casein and fat in the finished cheese

A casein/fat ratio of 7 produces approximately 52% fat in the dry matter of the cheese

Casing—The plastic tubing used as a covering and protection for Process cheese and Process cheese foods

Check Testing—The periodic and regular sampling of a product from a production line to check for quality moisture fat etc

Cheddaring, (Matting)—This operation is the piling or matting or packing of the cheese curd and cutting it into strips 5 to 6 inches wide at right angles to the vat then repiling until it is firm enough to be piled in layers

The object of the cheddaring process is to control moisture content by regulating the removal of whey and to form the characteristic body and texture in the curd

Cheese Agar Plate Count—A method of determination of the number of bacteria in cheese See Milk Industry Foundation Manual

Cheese, (Aged)—Cheese which is fully ripened or cured and has a pronounced typical flavor and well broken down body

Cheese Aroma—The volatile constituents of cheese some of which are volatile acids ketones and esters of fatty acids

Cheese, Assemblers of—Their functions are: Transport the cheese from factory to warehouse Grade and weigh the cheese (Grading by licensed grader) Make fat and moisture analysis Brand the cheese Paraffin the cheese Box and cure the cheese until sold

Cheese Bandage—A cheesecloth which acts as a covering for cheese The purpose is to retain the form of the cheese and to provide wicking action to close up the cheese surface A non woven bandage may also be used to close up the surface

Cheese Blender—The man who blends the cheese of proper age and flavor to achieve the desired qualities of body and flavor in the finished process cheese

Cheese Boards—The circular wooden boards on which Swiss cheese is placed for turning and handling

Cheese Body—This characteristic of cheese usually associated with the moisture content is composed of several elements such as firmness springiness crumbliness and smoothness Body is usually measured or ganolepically as the resistance to pressure when manipulated between the thumb and the first two fingers

Cheese Books—"Cheese Varieties and Descriptions"—U.S.D.A Agr Handbook #24
"Cheese"—Van Slyke & Price Orange Judd Pub Co 1949

Practical Cheddar Cheese Manufacture—Wilster O.S.C. Co-op Association Corvallis Oregon 6th edition 1949

"Fancy Cheese in America"—Fisk, American Sheep Breeder Co Chicago 1910

"Cheese Making"—Sammis—The Cheese Maker Book Co Madison Wisconsin 7th edition 1924

See Judging and Grading Cheese in Judging Dairy Products by J A Nelson and G M Trout—Olsen Publishing Co Milwaukee 1931

"Cheese Manufacturing, History of" by W V Price in the Golden Jubilee Issue of the Journal of Dairy Science

Cheese Box—A box in which cheese is shipped which may be made of wood or fiber.

Cheese, Branding—Marking cheese with the Grade Vat Number and Lot Number, which is done with an approved indelible ink.

Cheese, Brief Description and Making Directions for Principle Types of—See Handbook P. 151.

Cheese, Brief History of—See Handbook P. 150.

Cheese Cake—A baked mixture of bread product, Bakers' cheese, bread flour, eggs, cream, sugar and flavoring.

Cheese Circles—Starched cheesecloth pressed to the top and bottom of bandaged cheese.

Cheese Classification—

1. Very hard (grating)
 - Bacterially ripened—*Asiago, Parmesan, Spalen, Romano, Sapsago.*
2. Hard
 - (a) Bacterially ripened—*Cheddar, Stirred Curd, Caciocavallo, Edam.*
 - (b) Bacterially ripened (eyes)—*Swiss, Emmentaler, Gruyere.*
3. Semi-soft
 - (a) Bacterially ripened and smear ripened—*Brick, Münster, Limburger, Port du Salut, and Trappist.*
 - (b) Mold ripened—*Roquefort, Gorgonzola, Blue, Stilton and Wensleydale.*
4. Soft
 - (a) Ripened—*Bel Paese, Brie, Camembert Cooked, Hand, Pont l'Eveque.*
 - (h) Unripened—*Cottage, Pot, Bakers', Cream, Mysoor, Primost and Ricotta.*

Cheese Coagulators—Commercial preparations containing calcium chloride, rennet and acids which are added to milk to increase curd strength of cheese.

Cheese Coating Base—A spray dried Cheddar cheese product used in making cheese coating for food products and for making fillings for cheese crackers, etc.

Cheese Color—A color or dye material commonly added to milk for cheesemaking in order to bring the color of the cheese to the desired shade. It is also used in the artificial coloring of ice cream. The coloring material is either water soluble extract or annatto or coal tar dyes and is carried in an alkaline water solution. These materials

add color to both casein and fat in contrast to butter color which is an oil solution and mixes only with the fat. These colors must be certified by the Federal Government, through the Bureau of Chemistry, U.S.D.A.

Cheese Color Reference Standard—A set of color standards numbered from 0-10 for designating cheese color of Cheddar Cheese.

Cheese Consumption, (all types)—approximate, in U. S.

	per capita
1930-39	5 lb.
1945-49	6.84 lb.
1952	7.7 lb.
1953	7 lb.

Cheese Crock—Earthenware containers for merchandising some types of Club and soft cheese.

Cheese Curd—The coagulated or thickened part of milk as distinguished from the whey or watery part. The composition of curd made from whole milk is approximately as follows: Fat 34%, Casein 25%, Water 37%, Milk Sugar and Mineral Matter 6% (total 100%).

Cheese Decomposition Products—Ammonia, leucine, tyrosine, phenyl alanine, lysine, arginine, glutamic acid, guanidine, putrescine cadaverine, oxyphenyl-ethylamine (tyramine) indole and skatole, carbon dioxide, methyl ketones (indole and skatole in Limburger).

Cheese Drying—The process of drying cheese prior to paraffining which, for Cheddar cheese, takes place in a room at 55-60° F. with a relative humidity of 50%.

Different varieties of cheese require different drying conditions.

Cheese Exchange—A marketing method for cheese in which offers to sell and buy are listed. See Plymouth Cheese Exchange.

Cheese Factory—The building and machinery or equipment where milk is made into cheese. The factory system developed when the milk from a number of farmers was gathered and made into cheese in one building.

Cheese Flavor—Esters of fatty acids—butyric, capric, caproic, caprylic, lactates, acetic and propionic acids and their esters, and methyl ketones are factors in the production of good flavored cheese.

Among those that contribute to decomposition and off-flavors are aliphatic acids, aldehydes, alcohols and esters.

Cheese Follower—A metal disk which is placed on top of the cheese in a hoop during pressing

Cheese for Processing-Classification—Current aged less than one month Short Held aged less than six months Long Held aged or storage over six months of age

Cheese Grades, New Zealand—Finest grade 83 score and over—First grade 90 to 92 Second grade—Under grade

Cheese Hoops and Molds—Many different designs of hoops and molds have been patented. Some of them are for small one to two lb cheese while others are for cheese weighing thousands of pounds. Wooden hoops have been largely replaced by metal hoops and the trend has been from straight sided to the tapering variety. The hoops are largely telescopic with devices to hold the bandage in position and which prevent ridges on the cheese. Some are provided with clamps in which the cheese can be pressed without the need for a separate cheese press

Cheesmaking Methods—See Handbook P 134

Cheesmaking License—The license issued to qualified cheese makers by the state authorities in principal cheese producing states

Cheese Meltng Salts—A British term for emulsifying salts used for Process cheese

Cheese Paraffining—The act of dipping or coating cheese with wax or paraffin or a mixture of these. The cheese is dipped into the hot mixture (220° F)

The amount of paraffin adhering to the surface depends upon the temperature (the higher the temperature the thinner the coating) and the number of times the cheese is dipped. The cheese is paraffined to protect the surface and to prevent moisture shrinkage

Cheese Pouches—The preformed wax coated bags in which process cheese is poured and molded. These pouches are heat sealable

The cheese is poured in the packages the flaps are folded over and the heat of the cheese seals the package

Cheese Press—A device which presses the curd of freshly made cheese into a solid mass with as few mechanical holes as possible. The primitive forms of cheese presses working by means of a weight were first replaced in American cheese factories

by vertical screw presses. Then came the horizontal gang presses by which a long row of cheese was pressed by means of one screw or by a hand lever. In the past few years constant pressure hydraulic presses have become popular for cheese. On account of the shrinkage in size which cheese undergoes while in the press over night several devices have been contrived for automatically taking up the shrinkage and keeping the cheese under pressure. The simplest of these "continuous pressure" devices consists of a set of one to four coil springs, enclosed in an iron box which is put in the press along with the cheese. Water pressure or air pressure are now largely used to give continuous pressure to the cheese

Cheese, Size of—

Name	Wt of Cheese in lb	Size of Cheese in in	Height of Hoopless Bandages in in
40 lb Square Wilson Style	40	14 $\frac{1}{8}$ x 11 $\frac{3}{8}$ x 6 $\frac{1}{2}$	
60 lb Square Wilson Style	60	14 $\frac{1}{8}$ x 11 $\frac{3}{8}$ x 9 $\frac{1}{4}$	6
80 lb Square Wilson Style	80	14 $\frac{1}{8}$ x 11 $\frac{3}{8}$ x 13	6
Brick	5	5 x 10 x 5 $\frac{1}{2}$	5 $\frac{1}{2}$
Salami	13 $\frac{1}{2}$	21 $\frac{1}{4}$ x 4 $\frac{1}{4}$	
Provolone	15	13 $\frac{1}{2}$ x 5 $\frac{1}{4}$ x 4 $\frac{1}{4}$	
Ricotta	6 ¹ 2 ²	10 x 6 $\frac{1}{2}$ top and 6 bottom	10

¹ fresh
² dry

Cheese Solids Determination—See Moisture test

Cheese Spreads Plate Counts—A method for the determination of the numbers of bacteria in cheese spreads. See Milk Industry Foundation Manual

Cheese Sword—An old type of curd knife for Swiss cheese shaped like a sword for cutting the curd vertically

Cheese Texture—Compactness or appearance of solidity of a cheese. The degree of openness either mechanical or gas. It is quite common to regard the "body" as a part of the texture but the two qualities are clearly distinct

Cheese, Uncolored—Cheese to which no coloring has been added. It may be very pale straw or cream white in color

It can range from low to high degree of yellow depending on fat content and season of year

Cheese Wrappers—Wrapping material for cheese for curing and consumer cuts which is usually a flexible transparent film. These films may be composed of cellophane, wax, rubber or latex combinations. See also *Strip-coating*. *Piscan* and *Pisten*—The trade names for plastic film wrappers for cheese.

Cling, (cheese)—A term applied to the wrapping of natural cheese which refers to the adhesion between the wrapper and the cheese.

Clostridium Perfringens—Organisms found in gassy or rind split Swiss.

Cookers, Cheese—The equipment in which process cheese, process cheese foods and cheese spreads are pasteurized. A steam jacket encloses a horizontal cylinder in which is a screw conveyor for agitation of the cheese mass. The comminuted cheese in the horizontal cylinder is heated mainly by direct steam injection but also by means of the steam jacket. Vertical cookers are also used in smaller plants.

Cooking, (in cheesemaking)—The heating of curd and whey to aid in the expulsion of whey from the curd. For example, Cheddar cheese is cooked at 102° F. and Swiss cheese at 120-127° F. The temperatures are varied as a means of controlling the final moisture of the cheese.

Cooling Tank, (for cheese)—A tank of cold water in which hot Italian curd is placed for cooling after forming.

Core or Plug Sample of Cheese—For analysis, the plug of cheese is taken vertically (top or bottom) from a cylindrical cheese.

Cottage Cheese Coagulators—Commercial preparation of dilute solutions of coagulating enzymes of rennet or pepsin or both. These preparations may also contain harmless color and flavoring ingredients. These coagulators are claimed by the manufacturers to produce better cheese. Citrates or citric acid may be used as they aid the flavor producing organisms.

Cream Cheese, (low acid) — See Cream cheese—cooked curd.

Cream Cheese, Stabilizers—Carob bean gum, gelatin, gum karaya, gum tragacanth, guar gum, carboxymethyl-cellulose, carrageen, oat germ algin (sodium alginate, and algin derivative) propylene glycol ester of alginic acid. Not over 8% of these stabilizers or water retaining agents may be used.

Culture—The propagation of selected strains of microorganisms. (See Starter).

Curd, Acid—The curd obtained by the action of acid (without rennet) as in some types of cheesemaking. An acid curd is inelastic but is open and sticky as contrasted with a rennet curd. The calcium and phosphorus attached to the protein are converted into soluble salts and largely remain in the whey. Cottage cheese is largely an acid curd cheese.

May also refer to normal cheese curd which has developed too much acid during the making process.

Curd Breaker—A row of parallel horizontal knives at the end of a wooden handle used to cut the curd horizontally. This breaker was in use prior to our present curd knives.

Curd Concentrator—A centrifugal separator which separates the curd from a portion of the whey in the production of Baker's cheese and eliminates the need of bagging.

Curd Dust—The small curd particles formed by excessive agitation before cooking. These fine granular particles normally pass through the strainers with the whey and thereby represent a loss of yield.

Curd Knives—1. Devices for cutting the curd in cheesemaking. They consist of a metal frame inside of which are set a series of steel blades or wires spaced at variable widths depending on type of cheese being made and amount of moisture desired. Curd knives are of two types, the horizontal and the vertical, according to the way the blades or wires are set in the frame.

2. Star-shaped knives which are used in soft curd testing to determine the tension of the coagulated milk. See Curd-o-meter.

Curd Mill—A piece of apparatus used in cheese making to cut slabs of curd into strips about one inch wide and from two to three inches in length before the cheese is put into the hoops for pressing, so as to permit efficient salting.

Curd Mixers—A device which consists of fingers on travelling drums for agitating and stirring milled curd. These drums are supported and driven from a horizontal track above the cheese vat.

Curd Presser (in cheesemaking)—A device for pressing Grana-type cheese in the bottom of the kettle.

Curd Rake—A wooden or steel rake used for stirring the curd during cheesemaking.

Curd Separator—A centrifuge of the sludge separator type which separates curd and whey in the making of certain types of Cream cheese

Curd Sink—A vat for draining Cheddar and Swiss cheese. It consists of perforated metal plates or spaced wooden slats inside a special vat to permit rapid whey drainage. It is used for forming the curd.

Curd Slurry—In cheesemaking—a thin mixture of curd and water.

Curing Cheese—The process of allowing cheese to age under the proper conditions of temperature, moisture, light, ventilation, acidity and saltiness to give it the desired flavor and texture. Curing is brought about by the combined actions of the bacteria, enzymes and molds, in or on the cheese, under favorable conditions for their development.

Curing Rooms—Rooms with temperature and humidity control in which cheese is ripened (cured) usually on stainless steel or wooden shelves.

Cutter, Hydraulic—A device for cutting cheese in the desired shape and size for merchandising or processing.

Cutting Wires—The wires on a hydraulic cutter or the wires on a curd knife.

Dairy Boards—A former method of marketing cheese. The board members met once a week. The factories offered cheese and the dealers bid on the cheese by auction.

Dairy Research Institute, New Zealand—DRI

DEFECTS IN CHEESE

Body Defects in Cheddar Cheese—

Corky, Stiff, Dry Weight—A defect of cheese in which the body of the cheese is over firm, hard and tough. The cause may be low moisture due to cutting the curd too finely, heating too long or at too high a temperature, stirring excessively or adding too much salt. The cheese has an elasticity like hard rubber and resists pressure when manipulating between the thumb and fore fingers. Generally associated with low fat or young cheese.

Crumbly—This cheese tends to fall apart when sliced. It is closely associated with meakness and with acid cut and seamy color.

Curdy, Rubbery—A defect of cheese characteristic of freshly made, green, uncured cheese. A test plug of such cheese resists pressure, but when it does yield, the plug tends to resume its original shape. The cheese will not work down to a pasty mass when worked between the thumb and fingers. Curdiness usually disappears as the cheese ripens—i.e. as the curd breaks down—and therefore this is not considered a serious defect in young (green) cheese.

Grainy, gritty, lumpy, or sandy—Cheese lacks uniformity and smoothness and shows presence of hard particles of varying sizes when worked between thumb and fingers.

Greasy Curd—A defective condition occurring during the making of Cheddar cheese. This condition is caused by fat leakage from the curd after milling by too vigorous stirring. It may also be caused by improper heating, lack of firmness at dipping, fast piling or too high piling or by excessive acid development. The condition can be alleviated by washing the curd with water.

Mealy—A body defect of cheese characterized by a grainy powdery condition which feels like cornmeal when worked between the fingers and thumb. This cheese tends to be dry and short and has little elasticity. Mealy cheese nearly always is associated with high acid development.

Pasty—A body defect of cheese, the cheese forming a thick, soft, pasty or sticky mass when worked between the fingers. This defect is usually found in cheese with excessive amounts of moisture. See Weak Body. See also Burer and Ice Cream Defects.

Short Body—This defect shows a lack of meakness or of closely knit texture, is flaky and breaks easily, has a more or less glistening surface, is slightly dry and is inclined to be mealy when worked between the thumb and fingers.

Spongy—This defect of cheese is denoted by its failure to yield a full, continuous plug with gas openings which may be so numerous as to weaken the structure. When the cheese is plugged, it tends to sink immediately adjacent to the trier. Sponginess results from excessive gas production. The defect is generally traced to unsanitary handling of milk in barn or in cheese plant.

Generally associated with a gassy high moisture, weak bodied cheese.

Weak—A cheese which requires only a small amount of pressure to break down the cheese between the thumb and the first two fingers. A weak body is often associated with high moisture content, which may have a whey taint or fruity flavor.

White Whey—A defective condition which may occur during the making of Cheddar cheese. It is due to excessive loss of fats after milling. See Greasy Curd.

Color Defects—

Acid-Cut—The most common color defect of cheese. The rind may be dark with the cheese becoming lighter toward the center. The color may not be uniform throughout the cheese. It appears dull and lifeless. A faded, acid-cut color is usually associated with a high acid development and a sour flavor. Localized bleaching may be due to the accumulation of whey or moisture in pockets.

Bleach—A defect of rindless Cheddar which occurs after a few months, and appears as a whitish layer on the surface in contact with the film. Possibly due to oxidation of the color.

Blue—A defect of cheese caused by chemical or bacterial action. If the entire surface is covered by the color, it is caused by the action of lactic acid on iron or copper vessels. Blue spots are sometimes caused by *B. cyonofuscus* (in Edam cheese) which grows in surface waters, or by various iron bacteria. This defect is uncommon.

Foreign Color Specks—These may be white or black specks, rust spots, or red blotches. These may have no effect on flavor but are undesirable.

High—Unnatural color, a deep yellow due to adding too much cheese color, not liked in most markets.

Mottled—A defect most frequently encountered in colored cheese. The cheese is streaked and uneven in color. It may be due to uneven distribution of moisture, to the use of unbroken or lumpy starter, or to the addition of old curd from a previous day's make. Uneven salt distribution may cause mottled color. When the mottled color is due to microbial growth, the defect may be associated with a yeasty, fruity or acid flavor. The remedy for the trouble exists only in its prevention.

Pink—Reddish brown color of Cheddar due to potassium nitrate and the presence of nitrate reducing organisms, *Pseudomonas fluorescens*.

Red Discoloration—This defect of Cheddar cheese may be due to the reaction of the nitrate with the annatto color. The reduction of the nitrate is caused by bacteria. This reduced nitrate then reacts with the annatto.

Rusty Spot—Reddish-brown spots which appear through the cheese but do not affect flavor. Caused by *Loctobacillus plantorum* var. *rudensis* or *Lactobacillus brevis* var. *rudensis*.

Salt Stones—**White Specks**—These white particles may be noticed in a well-aged, cold-cured Cheddar cheese. They have been variously reported as calcium lactate and tyrosine.

Seamy—A color defect of cheese appearing as a light colored line around each piece of curd. Looking squarely at the surface of a freshly cut cheese, the surface appears to be interlaced with many light colored lines. This defect is often caused by fat which coats the surface of the curd particle and prevents casein adhesion between two adjacent particles. Hence the cheese may be short bodied. Prevention of excessive fat leakage, or washing the fat with warm water will prevent this defect.

Wavy, (uneven)—This defect is often due to layers of curd taken from different batches or may be due to difference in add-development in various areas of the cheese.

White Specks—White particles which may be found in a well-aged Cheddar cheese. These are hard and irregular and may get to be as large as peas. They occur in cheese during cold curing process. They have been variously identified as calcium lactate and tyrosine. See Salt Stones.

Finish & Appearance Defects—

Blue Cheese Slime—The viscous, smeary surface found on the surface of a well cured Blue cheese which has been found due to *B. linens*, micrococci and yeasts on surface, associated with high humidity in curing rooms.

Huffed or Bloating—A general term applied to cheese which is bulged or pulled out on the sides or swelled due to excessive activity of gas-producing bacteria which may have originated from animal feces. *C. welchii* (Swiss, *B. amylobacter* (process) and acrobacter-aerogenes group may be the cause of these defects. A huffed cheese yields an open plug which is full of holes.

Molding Surface—A mold growth occurring on portions of the cheese where the paraffin has broken or where oxygen and moisture are available. The mold may grow on the under surface of cheese where it has been next to the shell. Some surface mold may be prevented by circulating air slowly in the curing rooms. This will keep the surface of the cheese dry so that mold is not likely to form. A serious defect which may result in great loss to the cheese industry.

Paraffin—Paraffin defects in finish of cheese which may give molds and cheese pests a chance to develop.

- 1 Blistered—thin loose patches of paraffin usually on ends of cheeses where cheesecloth may be lacking.
- 2 Checked—breaks or cracks in the covering usually due to a too heavy coating of paraffin.
- 3 Rough—the surface of the cheese feels rough as if it had not been clean and smooth before it was dipped in the paraffin.
- 4 Scaly paraffin—a common and serious defect of Cheddar because the loose scales allow moisture to escape and fungi to gain entrance. The paraffin scales also may become mixed with the cheese when it is cut. This condition may be prevented if cheese is sufficiently dried before completely dipping it in hot paraffin (220° F) for 10 seconds and then allowing paraffin to harden completely after cheese is removed from dipping tank.

Rinds, Cracked—Rinds of cheese which have openings or cracks in their surfaces. Rapid drying-out of the cheese is one of the principal causes of this defect. The cheese should be cured in the presence of adequate moisture. Cracks also occur if bandage is torn or missing. A serious defect as the cracks allow the cheese to dry out and permit the entrance of molds and mites.

Rind Defects—Rot Spots—Surface decomposition of cheese usually due to bacterial action. Sometimes referred to as soft spots or water spots. It is a serious defect in cheese inasmuch as the cheese adjacent to such spots is unsalable and represents a waste and sometimes the intense bitter unclean flavor of the rot spot passes through the entire cheese. The cheese often becomes brown in color near these spots. Cheese mites may open the paraffin so that bacteria gain entrance and cause these spots to appear.

Rind Rot—The development of wet areas on the surface of the cheese directly under the paraffin indicates the beginning of rind rot. This encourages putrefactive organisms which develop foul odors and flavors.

Rind rot is caused by 1 excessive moisture 2 excessive acidity 3 any condition permitting mites and molds to grow beneath the surface 4 lack of turning during storage 5 lack of ventilation in storage rooms. Molds and mites beneath the surface promote this defect as they decrease the acidity and thus encourage the growth of putrefactive organisms.

Noticeable soft spots on the surface of cheese exuding a watery substance may indicate the beginning of rind rot.

Finish & Appearance Defects—

Workmanship—

- 1 High Edges—uneven thick dry edges which do not cure properly are inedible and therefore wasted.
- 2 Misshapen Cheese—(Lopsided & Hill side) Cheese characterized by its non-parallel ends as a result of uneven distribution of the curd in the hoops together with unequal pressure in the press. Often associated with weak bodied cheese.
- 3 Uneven edges—heavy pressure in the press against too small press boards causes the curd to squeeze out around the edges making a dry rim about 1/2 inch thick which results in a waste of curd and poor appearance of the finished cheese.

Flavor Defects—

Pitter—A common defect of Cheddar associated with inferior milk, poor starter, high acid, high rennet and certain types of organisms such as *S. citrovorus* or *S. para citrovorus* and *Torula amara*.

Cooked—A defective flavor or odor of dairy products resulting from excessively high pasteurization temperatures or improper methods of heating. In the holding system of pasteurization, cooked flavor is likely to occur if too high temperatures are used.

Fermented—A rather uncommon off flavor of dairy products. It is most often found in cheese and there only occasionally. It is somewhat similar to a "fruit store" or pine apple flavor. It is sometimes associated with pasty or weak bodied cheeses.

Green—An off flavor found in cheese which may not have been aged long enough. A flat or curdy flavor. The flavor of immature cheese.

Heated Flavor—An off-flavor, somewhat resembling the cooked flavor of pasteurized milk, found occasionally in cheese and more frequently in butter. It is caused by overheating or burning the milk products used, or by too frequent use of superheated condensed milk products. It is not easy to detect because other flavors tend to obscure it.

Moldy—An off-flavor of cheese that is easily recognized as such, for it is similar to the odor of a musty, damp, poorly ventilated cellar. The slightly unclean flavor tends to persist in the mouth.

Roquefort—An objectionable flavor due to hydrolysis of the fat and an accumulation of the following fatty acids: capric, caproic and caprylic (peppery taste).

Unclean—A flavor defect of dairy products found most frequently in cheese, although it is occasionally present in milk and butter. Dairy products with this defect have an offensive flavor and odor and an unpleasant sickening aftertaste. Bacterial contamination during the curing of cheese is the principal cause.

Yeasty—A defect of cheese characterized by a sour, bitter flavor and small pin holes which enlarge into "fish-eye" slits. This defect is due to the presence of yeasts in the milk or in the starter used for cheese making. The cheese develops glossy surfaced gas holes due to yeast fermentation. The body is spongy. Usually accompanied by a yeasty alcoholic odor.

Whey Taint—A flavor defect of cheese associated with high acid. It may result from the inclusion of too much whey in the curd or the inclusion of too high a lactose content which ferments and gives this whey-like flavor. It may be associated with a dull acid-cut color.

Surface Defects—

Slip Coat—Name applied to cheese, the outside or rind of which becomes soft and the surface slips off readily. Similar to "Slippers."

Slippers—Cheese which becomes liquefied at the surface and causes the cloth to slip off when the cheese is handled. May be due to liquefying or proteolytic bacteria. See *Slime of Blue Cheese*.

Texture Defects—

Bacteriological Openings in Cheese—Holes due to bacterial growth in the cheese as it

ripens. See fish eyes, gas eyes, pin holes, slit-openness, yeast holes.

Fish eyes—yeast holes, gas eyes—Elliptical openings in cheese due to the action of yeast. This cheese has a spongy body due to excessive gas production. These yeast holes may later flatten, forming long narrow slits known as gas eyes. This defect is usually accompanied by a yeasty, alcoholic odor.

Gassy—A texture defect of cheese which is characterized by a great many holes which are shiny around their surfaces. Due to formation of gas by bacteria that gained access to the milk some time during handling. May be of the *Escherichia-Aerobacter* group. A fermented off-flavor is often associated with a gassy body.

Mechanical Openness or Mechanical Openings—The openings of irregular shape and size which exist in a cheese after pressing due to a failure of the curd to unite during matting and pressing.

This defect is associated with a lack of acidity. Contributing factors may be too low a temperature, entrapment of too much free whey and lack of pressing. See *Openness*.

Openness—A common defect of cheese which relates to the number of openings in the cheese. These holes or openings may be mechanical or bacteriological. (See *Mechanical openness*) and (*Bacteriological openness*).

Pin Holes—Small, uniform, spherical holes formed by undesirable organisms. The size is about the size of the head of a pin. This gassy defect is usually associated with unclean or fruity flavors.

Slit-openness—A defect of Cheddar cheese which has been caused by the *Escherichia-Aerobacter* group, *Lactobacillus brevis*, and *Streptobacterium planatarum*. The open texture of this type of defect is similar to mechanical openness in size and occurrence.

Sweet Curd Holes—Spherical, shiny holes found in Cheddar and Swiss cheese. In Cheddar cheese these sweet holes are usually associated with lack of acid development, the result of a particular bacterial growth and flavor similar to Swiss—not typical of Cheddar. Also called *Shot Holes*.

Yeast Holes—Fish Eyes—Elliptical openings in cheese caused by the action of yeasts. See *Fish eyes*.

Limbarger Defects—

Red Spots—Caused by *Micrococcus roseus*

Process Cheese Defects—

Blowing—Caused by butyric acid bacteria

Darkening of the Color—This is caused by the condensed whey and phosphates on drying due to proteolyzing of the protein apparently an interaction between NH_2 group and aldehydes

Gassiness—May be caused by *B. amylobacter*, *B. putrificus* and butyric acid bacteria. May be prevented by increasing pH to 5 and increasing NaCl content

Glass (in cheese)—Crystals of lactose in process cheese foods. See Process cheese

Gritty Cheese—Process cheese which may contain crystals of calcium tartrate if too high a level of sodium potassium tartrate is used as an emulsifying salt

Swiss Cheese Defects—

Acid Ghas Cheese—Short bodied Swiss. See Glass

Blind—A Swiss cheese with little or no eye formation or partially blind with very few eyes the propionic acid bacteria (eye formers) have not developed. The characteristic Swiss flavor is often lacking

Bloats or Blower—An easily recognizable defect due to the huffed bloated appearance of the cheese. The cheese will be well rounded or puffed out on all sides and in extreme cases may be cracked. This defect is often associated with yeast growth in a high moisture cheese

Blow Holes—A defect of cheese (Swiss) caused by gassy fermentation in too warm a room or ripening cellar

Blowholes—Abnormally large eyes usually four inches or more

Brown Red or Pink spots—caused by *Bact. acid. propionici*. Since these organisms are quite abundant in manure it is quite likely that such contamination of the milk has occurred. Remedy—cleaner produced milk

Cabbage—A cheese with eyes so numerous within the major part of the cheese that only paper thin layers of cheese are left between the eyes causing the cheese to have very irregular eyes and a cabbage appearance

Checks—Short cracks within the body of the cheese

Dead Eyes—Developed eyes that have completely lost their glossy or velvety appearance, and may also be rough

Dry Splitting—Usually refers to a splitting on the cheese surface

Dull Glossy Eyes—Eyes that have lost some of their bright shiny luster

Frog Mouth—A term applied to Swiss due to faulty pressing and too much gas development. If the cheese presses out between the hoop and the lid a condition is developed which may later develop into a rind split or crack

Glass—Glaesler, or Glaesler—Sizeable cracks usually in parallel layers and clean cut found within the body of the cheese. Apparently due to short textured curd which did not respond to normal eye growth. Excessive glass means glass cracks so generously distributed that the cheese will not slice well

Nests—Numerous small irregular shaped holes which appear in clusters or groups within the cheese. These clusters of holes usually appear near the surface

Nisler or Nisler or Pinholey—(Nisler means a thousand eyes)—A defective Swiss cheese characterized by many pinholes or small eyes distributed quite uniformly throughout the cheese or a large portion of it. The defect is caused by the growth of anaerobic spore forming bacteria of the *G. Welchii* type which set up an abnormal gassy fermentation in the cheese after it has been placed to ripen. The name is also applied to the gassy fermentation which produces this defect

One Sided—Well developed eyes on one side but imperfections on the other

Oversetting—A term applied by Swiss cheese makers to cheese which has an overdevelopment of small eyes

Picks—Small irregular or ragged openings within the body of the cheese

Pressler Cheese—A gassy fermentation in Swiss cheese. A Pressler cheese is one in which the gassy fermentation appears rapidly in the cheese on the press table. The gas holes are often large and in most cases confined to an area near the surface. Usually caused by the *colon aerogenes* group of bacteria which readily set up lactose fermentation. Has also been caused by a lactose fermenting yeast.

The principal sources of this trouble are

often manure or silo contamination, unwashed utensils, or lack of starter or other acid-forming bacteria to check gas formation.

Shell Eyes or Holes—Nutshell (rough, ragged) appearance on the surface of the eyes. **Small-eyed**—Eyes less than $\frac{5}{16}$ of an inch in diameter.

Splitting—Splits occurring inside the cheese. **Stinker Cheese**—A name applied to Swiss cheese which has developed spots of unclean flavor and odor, resembling hydrogen sulfide or rotten eggs. This defect is due to the abnormal activity of putrefactive organisms mainly *B. putrificans* or *Cl. putrificum*. This is possibly the most serious defect of Swiss cheese. Also applied to other cheese such as H.S. Stinkers in Cheddar cheese. It is thought that good sanitation and better starters will prevent this trouble.

Whey Spotted—A Swiss cheese with irregular white spots on the surface.

Undergrade—Cheese which is defective so as to make it undesirable for storage.

Weeping—The exudation of liquid from a cheese. This occurs in an aged cheese and the liquid is the result of protein decomposition.

It may also occur in a young cheese due to too high acidity or salt, or too high a moisture in the cheese. This defect may occur when a warm cheese is placed in the cold room. Weeping is then due to the contraction of cheese during cooling. Cheese being force-cured may weep.

Dehydrating Cheese—In one method the cheese is forced through a 30 mesh screen, a $\frac{1}{16}$ inch extrusion orifice and is mixed with water at 140-150° F. This emulsion is then vacuum dried.

Another method subjects shredded cheese during agitation to increasing temperatures up to 145° F. under vacuum until the moisture content is reduced to less than 3%.

Dehydroacetic Acid—An antimycotic agent (a chemical which prevents mold growth) is sometimes used on cheese and wrappers.

Dipping—A term applied to the operation of separating the curd from the whey. It is called dipping because in the early days of cheesemaking the curd was literally dipped with pails and scoops from the cheese vat to a rack covered with a draining cloth.

May be done by pumping to a draining table where separation takes place.

Dipping Pail—A flat sided pail used to dip curd and whey slurries from the vat in some cheesemaking operations, such as Brick.

Ditching—The process of pushing the curd to the sides of the vat before drainage, leaving a ditch or drain down the center to facilitate rapid whey removal as in Cheddar operations.

Draining Boards—Boards made of white-wood which have parallel grooves to allow rapid whey drainage.

Draining Mats (Cheese)—These are made from fine bamboo strips fastened together with strings for the purpose of draining Camembert and similar types of cheese.

In some countries rush or straw mats are used.

Draining Table—A table having a draining surface such as perforated metal or grooved boards on which molds of cheese are drained.

Draw Knife—A special knife for cutting large wheels of cheese.

Drawing the Vat—New Zealand term for dipping.

Dressing—The English term applied to all external treatments for protection from shrinkage, mold growth, rind rot and insects, etc. by the use of oil or fat. Flour and cellophane bags also are used.

In the U. S. paraffin is one of the most commonly used dressings. Dyes as in Edam cheese, chili powder, lamp black, etc. are used in various countries.

Dressing the Cheese—After the initial pressing of the cheese, the hoop cover is removed, the press cloth lifted off the top and the bandage is pulled up on all sides and folded smoothly over the top to prevent wrinkles in the cheese. The bandage is then flattened to the top of the cheese with hot water and a starched circle is placed over it. This, too, is thoroughly soaked before the press cloth is put in place, and covered with the follower. Then the cheese hoop is replaced in the press.

Dressing the Hoop—The act of placing, positioning and fastening the cheese cloth or bandage in the hoop prior to filling the hoop with cheese, then placing the wet press cloth over the top of cheese before the hoop cover or follower is put in place. The hoop is then ready for the press.

Druggists or Confectioners Fold—A term used in connection with wrapping Swiss cheese. After wrapping cheese in film to form the end fold, lining top and bottom end flaps together, fold the top and bottom flaps toward back until they lie flush against the loaf. Then fold resulting ears across the end of the loaf to assure smooth surface.

Drying Room—A room where Cheddar cheeses are placed on shelves to dry at a temperature of 55-60° F. with a relative humidity of 90%. The cheeses are turned every 24 hours until ready for paraffining.

Dry Matter in Cheddar Cheese—Consists of 63-65% of the weight of the original cheese. Analysis of dry matter—Fat 53.5%, Solids not fat 46.4% (which consists of casein 37.5%, and salt and other mineral matter 8.9%).

Dry Salting—The application of salt rubbed onto the surface of Swiss, Romano, Ancho, etc. cheese during curing as contrasted to being washed or soaked in a brine solution.

Elasticity of Cheese—The behavior of cheese body which causes it to resume its original size and shape after being subjected to a pressure which should not be enough to cause flow or rupture.

Electronic Sealing—The sealing of plastic films on packaged cheese by electronic devices.

Emulsifying Agents or Salts—Chemicals which may be added to Process cheese to prevent fat leakage. Up to 3% of the following may be used: Monosodium phosphate, disodium phosphate, dipotassium phosphate, trisodium phosphate, sodium metaphosphate, sodium hexametaphosphate, sodium acid pyrophosphate, tetrasodium pyrophosphate, sodium citrate, potassium citrate, calcium citrate, sodium tartrate and sodium potassium tartrate.

Enzymes of Cheese—Among the principal enzymes of cheese are Rennin, Pepsin, Protease and Lipase.

Exudate—The thick viscous proteinaceous liquid which leaks from the cheese particularly during high temperature shelf-curing.

Eyes in Cheese—The large round shiny openings found in cheese due to the growth of gas-forming bacteria. The prime example are the eyes of Swiss cheese caused in part by *Propionibacterium shermanii*. The gas formed is carbon dioxide.

Eye Formation in Swiss Cheese—Eye formation is due to gases generated throughout the cheese. These gases are in solution under pressure and when this pressure exceeds the strength of certain weak points in the cheese, the gases pass out of solution at these points to form eyes. After some eyes have been formed the gases will tend to collect by diffusion in these gas bubbles because the larger the bubble the less pressure is required to sustain it. If the gas production is very rapid diffusion in larger eyes may not disperse the gases rapidly enough and many small eyes develop. Oversetting in Swiss cheese is the result. In a perfectly developed Swiss cheese the eyes are glossy or velvety with smooth even walls, round or slightly oval in shape and fairly uniformly distributed through the cheese. They are a chief characteristic of this cheese.

Eye-forming Cultures in Cheese—Bacteria which form gas during the aging of cheese. Among the most important are *Propionibacterium shermanii* and *Propionibacterium freudenreichii*.

Factory Score Card—A grading system of rating a cheese factory on such factors as sanitation and cleanliness of employees.

Faucets—Wooden hoops often made of birch veneer for Parmesan cheese.

Fat Cuit—A fast production of acid in the whey. May be partially controlled by higher cooking temperatures.

Fat Cured—See Shell-cured.

Fat Determination in Cheese—Babcock. See Dairy Tests.

Fat Leakage—Refers to the leakage of fat from the cheese during curing.

Federal Standards for Cheese—The standards for the various kinds of cheese are found in the Federal Register, Vol. 15, 164, August 21, 1950. For fat and moisture standards see Reference section p. .

Finish of Cheese—The workmanship of a cheese package as regards the outward appearance and style of package. Perfect finish is given a score of 15 in grading cheese. See Cheese Defects.

Flake Out—A term used to describe the desirable texture of Cheddar cheese prior to milling (Canada).

Flexible Wrappers—Films of cellophane, wax coated cellophane, polyethylene, or combination of some of the above used for wrapping cheese.

Forced Curing—Shelf cured, forced cured, warm cured. Cheese cured at temperatures approximating 50° F. which results in a sharp flavor within approximately three months.

Forced-drying—Cheese may be dried prior to paraffining by passing the cheese through a drying tunnel with positive air displacement. The temperatures and humidities are carefully controlled.

Foreworking—The firming of Swiss Cheese curd after cutting.

Forking Agitator—An overhead appliance used in cheese factories to agitate cheese in the cheese vat. It consists of agitator paddles which revolve while traveling back and forth in the vat.

Forming—The act of shaping a cheese manually or by the use of cheese molds.

Freezing Cheese—Causes a crumbly body and little or no ripening. Freezing point for Cheddar, 8.8° F.; for Swiss, 12-14° F.

F.W.F.S.—A term used in Australia for Fat in the Water Free Substance. Fat in the Dry Matter.

Gang Press—An old term relating to a horizontal cheese press where a number of cheeses were pressed simultaneously as contrasted with a vertical press.

Gas Production—The development of gas by microorganisms in cheese. In the normal ripening of Cheddar 0.5% of the weight of the fresh cheese is lost in the form of carbon dioxide in 20 weeks. Higher percentages would be considered undesirable from a shrinkage point of view.

Gas development in Cheddar may be caused by bacteria, yeasts and molds, among them: *Escherichia*, *Aerobacter* group, *Lactose-fermenting yeasts*, *Coliform organisms*, *Clostridium sporogenes*, and *S. citrovorus* and *S. paracitrovorus* (slight). In Swiss cheese, *Propionibacterium* are important.

Gate Pail—The perforated metal pail used to recover curd when hung on the gate of a vat.

Grader—An authorized person employed by the Federal or State Departments and commercial concerns to grade cheese.

Grades of Cheese, (U. S. Standards)—The attributes of a cheese are rated in terms of points or numbers in a judging process called scoring.

Grades of Cheddar Cheese

U.S. Grade AA—U.S. Fancy	93 or above
U.S. Grade A—U.S. 1	91-92
U.S. Grade B—U.S. 2	88-90
U.S. Grade C—U. S. Under-grade	Below 88
No Grade	May or may not be edible.

Grades of Cheese, (Canada)—

First grade—92 score and over.

Second grade—87 to 92 score.

Third grade—Under 87.

Below third grade—No score given. Containing foreign matter.

Granular Process—See Stirred-Curd Method.

Grinder—A comminuting machine to grind cheese prior to processing or in the making of a cold-pack cheese.

Grinding—An English term for milling cheese. The process of comminuting cheese into fine particles prior to its use in Process cheese.

Grip—The increase in acidity of the milk before the addition of rennet.

Gums—For cheese spreads and cream cheese the gums used are generally: Carob bean gum, Gum Karaya, Gum Tragacanth, Guar Gum, Oaigum.

Harp—A specially constructed wirecutter used for breaking the coagulated curd in the process of making Swiss cheese. Also called Swiss harp.

Hastener, (English)—A semi-open wooden cupboard fitted with shelves for drying Stilton cheese after forming.

Hayssen Wrapper—A commercial packaging machine for wrapping consumer cuts of cheese in a flexible film.

Heat Sealing—Plastic films which are used to wrap cheese can be sealed by the application of heat. Irons, hot plates, hot plates covered with teflon, and electronic devices are used to bond the film together.

Holes in Cheese—Holes in cheese may be of three types: See Mechanical openings, Gas forming organisms, Sweet curd holes.

Hoop Filler—A funnel shaped metal form, to fit into the hoop being filled, to prevent the spillage of curd.

Horizontal Curd Knife—A knife for cutting coagulated curd. It consists of horizontal wires on a frame. The size of the cut depends upon the distance between the wires which may be $\frac{1}{4}$ $\frac{3}{8}$ $\frac{1}{2}$ $\frac{3}{4}$ or 1 inch.

Hot Pack—Refers to a method of making Cream cheese. See Cream Cheese.

Hydrogen Peroxide for Cheesemaking—Where legal this compound is sometimes used to partly sterilize the milk prior to cheesemaking. This method is used primarily for milk used in making Swiss cheese which as yet has not been quite satisfactorily made from pasteurized milk. Catalase is used to release the excess hydrogen peroxide.

Inverting the Curd—Turning from top to bottom. After Swiss cheese curd is cut it is pulled forward with a scoop until the curd has been uniformly turned top to bottom and has been uniformly broken into cubes.

Italase—The trade name for a lipolytic enzyme solution which is extracted from the gland found in the mouth of milk fed calves. This solution is used in the making of Italian types of cheese instead of rennet paste. This enzyme has no coagulating power so rennet extract must also be used.

Italian Pasta Filata Cheese, Sizes and Shapes of—Cacciocavallo—no standard weight. 7-8 lb. Provolotte—ball shaped 4-5 lb. Provolone—ball shaped $1\frac{1}{2}$ lb. Provolone—ball shaped 1 lb. Montecchi—soft like Mozzarella with a lump of sweet butter in the middle. $1\frac{1}{2}$ lb. Salamini—2 lb. Scamorze—snow man shaped 10 lb. Salame—sausage shaped 10 lb. Gravanese Montecchi without butter 1 lb. Grants—sausage shaped 25 lb. or over. Bocconi Provolone 1 lb. Mandarin—flat like Gouda 1 lb. Orancini Provolone 1 lb.

Keeping Quality Test for Cheese—Tests are designed by companies who manufacture perishable cheese products such as process cheese, processed cheese foods, cheese spreads and packaged cheese. The cheese product is incubated at temperatures and humidities favorable for the growth of undesirable organisms and/or molds. The results of the test are a check on the keeping quality of the product under undesirable conditions which may indicate the sanitary conditions during manufacture or the heat treatments needed for sterility. The results also indicate how long the product should remain on store shelves before replacement.

Kettles, (Processing)—The kettles in which cheese is processed. These kettles usually have a helical (spiral shaped) agitator and direct steam injection for cooking the cheese product. The kettles may be either of the vertical or horizontal type.

Knead—The act of kneading cheese is similar to the action performed on bread dough. Kneading is carried out on the Pasta Filata types of Italian cheese. The curd at pH of 5.2-5.3 is placed in hot water at a temperature of 160-175° F. When the curd is removed it can be worked by hand into the desired shape and size. The kneading removes or works out any entrapped water and results in a cheese with a very long grain and very close tight body. This hot curd is often pulled like taffy during the kneading process.

"Kottage"—This is a trade mark name used by General Ice Cream Corporation to identify low heat nonfat dry milk for specific use in the manufacture of Cottage cheese.

Kryvac—The trade name for a heat shrinking plastic film used in wrapping cheese for curing. The process involves placing the cheese in an appropriate sized Kryvac bag, removal of air by vacuum sealing the bag and finally shrinking the film by immersion in hot water.

Kustner—The trade name for a machine for packaging cheese in plastic films.

Lab, Laab—1. The German name for rennet. 2. An obsolete method of preparing rennet from the fourth stomach of calves.

Lainures—Long narrow cracks in Gruyère cheese.

Lamp Black—Used to give a black surface for coating cheese often in combination with paraffin.

Lange Whey—A viscous whey that was quite generally used in Holland for making Edam cheese. The whey contains a lactic acid bacterium *Streptococcus hollandicus* which causes the viscous condition and produces acid at the same time.

Lap fold (Packaging)—A method of wrapping the cheese in a plastic film. The lap fold is made as follows:

1. Wrapping the loaf of cheese tightly with the lap or overlap on the long side of the loaf.
2. Pressing the lapped edges downward over the end of the loaf and folding in the double edges.

3. Lifting the bottom edge to overlap the upper part of the end closure.
4. Turning the two ears back smoothly along the sides of the loaf.

Lay-down Cooker—A horizontal kettle with a helical screw, and direct steam injection for cooking Process cheese.

Link—A small, round, sausage-shaped, film-wrapped package of Process or Club cheese.

Long Body—Refers to the desirable plastic or tearing characteristics of Cheddar cheese. A plug of such a cheese can be bent almost double without breaking.

Long Hold—A method of curing in which the cheese is held for long periods at low temperatures.

Lyre—An old name for a curd knife for cutting Edam cheese.

Make Sheets, (in Cheese)—The written record containing all the details for making a vat of cheese, such as times, temperatures, acidities, etc.

Marketing Cheese—See Plymouth Cheese Exchange.

Mats—See Draining Mats.

Matting—The blending together or fusing of the cheese curd particles to form a solid mat. See Cheddaring.

Mellowing—An English term which refers to the change taking place in the physical character of the curd during cheddaring, changing it from a rubbery, watery consistency into a soft silky, smooth, dough-like mass.

Meltability—The manner in which a Process cheese or Process cheese food melts down in cookery.

Mold—1. The container in which a cheese is formed; 2. The act of molding or forming as in Pasta Filata types of cheese; 3. The organisms such as *P. roquefortii*, *P. glaucum*, etc.

Mold Basket—The name applied to a perforated strainer inside a vat where the curd and whey are placed and through which the whey is subsequently withdrawn. Weights are placed on this drained curd and the curd is molded or formed in this type of curd sink.

Mold Powder—A powder of bread and *Penicillium roquefortii* which is used to inoculate blue-veined cheese. Bread is cut into 1/2 inch cubes, placed in flasks, and sterilized. A culture of *Penicillium roquefortii* is added and the culture is incubated until there is luxuriant growth. The mixture is then dried, ground into a fine powder and sealed in cans.

Mold Prevention by Ultraviolet Light—Ultra-violet light has been used to inhibit mold growth in cheese curing rooms. This may be effective if the cheese is close enough to the light. However, mold will grow in areas not exposed to the direct rays of the light.

National Cheese Institute, Inc.—The National Cheese Institute, Inc. is the only national association for the cheese industry. Membership is composed of business firms or organizations engaged in the manufacture, processing, assembling or distributing of cheese or cheese products. The objectives of the institute are to establish common ground on which its membership may meet for consideration of problems concerning the development of a sound cheese industry.

Its headquarters are located at 110 No. Franklin St., Chicago 6, Illinois.

Nelson Filling Machine—A machine for filling fluid, hot, plastic cheese into pouches.

Non-acid Milk—A colloquial term used by New Zealand cheesemakers to designate milk which hinders the development of acid by a normally active starter culture due to inhibitory substances produced by the growth of non-acid streptococci.

Notari Spino—A cutter for Italian cheese consisting of steel bands in a spiral shape.

Nutrient Retention—as a per cent of that in original milk.

	Cheddar Cheese	Brick Cheese	Blue Cheese
Calcium	60%	57.7%	46.2%
Phosphorus	53%	58.7%	43.3%
Riboflavin	25%	27.4%	30.1%

Oil Off Period—See Warm Up.

Pack Up—The stopping of acid production by bacteriophage.

Packaging Cheese—Cheese has been packed in many sizes and in many ways. The following should be considered essentials in a package: Protection against molds, Release of CO₂, Moisture retention, Visibility, Sales appeal, Economy, Cleanliness, Convenience,

etc. Cheese has been packaged in paraffin flexible film plastic aluminum foil parchment and cans. See Druggists or Confectioners Fold and Lap Fold.

Packing—The act of allowing the loose granular curd to mat along the sides of the vat after dipping which is the first phase of the cheddaring operation. The packing operation begins when the curd can be cut into blocks and turned without breaking. Packing begins approximately 10 to 15 minutes after dipping.

Paraffin Tank—A tank in which cheese is dipped in hot paraffin or wax. These tanks may be heated electrically or with steam coils and are usually thermostatically controlled. A counterbalanced wooden platform is provided on which to place the cheese for dipping.

Parafilm—The trade name for a highly flexible, moisture proof wrapper for cheese.

Parakote—The trade name for a cellophane film coated with a rubber wax composition.

Penetrometer—An instrument with a rod or needle which is dropped or forced into the material such as tar, grease, etc. to determine its consistency. It has also been used for testing the body of cheeses.

Perforating Piercing—See Punching.

Piling—The act of placing one block of curd on top of another, a phase of the cheddaring operation. About 30-45 minutes after packing, the blocks of curd are piled 2 high. Later the blocks may be piled 3 high. The purpose is to keep the curd warm and to aid in moisture and texture control.

Pitching Point, (English)—The time at which the curd is allowed to settle to the bottom of the vat before the removal of whey from the vat, a very important point in cheesemaking.

Pitching Tester, (English)—An apparatus to determine the proper time for pitching the curd. See Pitching Point.

Plastic State—A term applied in commercial cheesemaking. In the making of processed cheese the cheese is heated until the particles appear oily. With more heat the cheese becomes plastic or stringy, forming a continuous phase which gradually entangles the other cheese ingredients, making a homogeneous mass. At this stage the cheese is said to be 'pulled up'. This is called the plastic state.

Plasticizing—A name formerly used for the emulsification of Process cheese by emulsifying salts. These salts do make the cheese plastic having flow characteristics, hence they were called plasticizers. See Emulsifying Agents or Salts.

Plumfilm—The trade name for a plastic film in which cheese is wrapped and cured.

Plug—A long round, cylindrical-shaped sample drawn out from butter or cheese by means of a trier for the purpose of testing or judging the sample.

Plymouth Cheese Exchange—A cheese exchange located at Plymouth, Wisconsin where offers to sell and buy are listed on a blackboard. Stipulations of trading are specified as to assembling charges, freight differentials, availability of cheese 3000 lb minimum.

See Millett—Pricing American Cheese at Wisconsin Factories L. of Wis Bulletin 163.

Polycel—A film of laminated cellophane and polyethylene.

Pre-blending—A term used in the process cheese industry relating to the mixing of all dry ingredients (e.g. emulsifier, salt, non-fat dry milk, etc.) prior to processing.

Pre-packaging—Packing cheese of consumer sized cuts prior to curing.

Press Bags—Bags for separating curd and whey in some types of cheese, like Cream and Bakers. The bags are made of unbleached muslin woven loosely enough to permit whey drainage but closely enough to retain curd particles.

Press Plates—Perforated, weighted metal plates used to press the cheese curd in the vat or in a curd sink in the making of soft and semi-soft cheese, rindless Swiss and Herrgard. The use of press plates is covered in U.S. patents 2,195,462 and 2,494,636.

Press Vat—A type of curd sink in which the cheese is settled in the whey and pressed with press plates.

Pressure Pack—When cheese is wrapped in a plastic film for curing, it is placed in boxes with telescopic lids. A slight pressure is applied to the cheese by banding or by stacking the cheese in the curing rooms. The pressure tends to exclude air and provides intimate contact between the cheese and the film. This pressure pack tends to prevent mold growth. A warm-up treatment is usually given to the cheese after it has been packaged.

Price Formulas—Fat-plus-Casein Method of payment for milk. Most cheese factories are now paying on a straight butterfat basis. However, a few of the older factories have plans for paying on a fat-plus-solids basis, more specifically described as the fat-plus-casein basis which equals the pounds of fat plus the pounds of casein in 100 lb. of milk. In other words, the percentage of casein in 3% butterfat milk would be calculated by multiplying 3 by .4 (being the average increase of casein for every per cent of fat) which would equal 1.2 and then adding .9% (a constant between the fat and casein), which would give a total of 2.1% casein in the 3% milk. Thus, adding the 2.1 to the 3 would equal 5.1, the units of fat and casein. This is considered by some as a fairer method of figuring than a straight butterfat per cent and would be a more equitable method where there is extreme variation in fat content.

Froker-Hardin Formulas for payment of milk at cheese factories:

$$\begin{aligned} .23 & \text{ (cheese price - direct cost) } + \\ .004 & \text{ (cream price - direct costs) } = \\ & \text{price differential.} \end{aligned}$$

With the use of standardized milk the following formula is suggested:

$$\begin{aligned} .1466 & \text{ (cheese price - direct costs) } + \\ .0197 & \text{ (cream price - direct costs) } = \\ & \text{price differential.} \end{aligned}$$

Process Cheese, Control Tests—

1. **Weight**— $\frac{1}{4}$ oz. on a 2 lb. loaf and $\frac{3}{4}$ oz. on a 5 lb. loaf.
2. **Slicing**—To see if the cheese sticks to the knife.
3. **Break**—To check if the cheese exhibits a clean break. A weak or brittle body is undesirable.
4. **Body**—The body should not be too firm or too brittle.
5. **Taste**—Should have characteristic Cheddar flavor, generally described as pleasantly sweet, clean and nutty.

Process Cheese Salts—See Emulsifying Salts.

"Pull Up" of Cheese—See Plastic State of Cheese.

Punching, Skewering, Piercing—Fifty or sixty needles are inserted through a mold-ripened (blue-veined) cheese after forming. These openings allow air to penetrate to the center of the cheese, which is necessary for good growth and development of the aerobic blue-mold organisms.

"Quarg"—The curd resulting from the development of acid without rennet.

Re-dress—In the Swiss Cheese industry this term may relate to turning the cheese and placing fresh press cloths on the cheese. In the Cheddar operation this relates to placing new bandages on the cheese.

Reaumur Thermometer (R.)—Used in this country by Swiss operators in the making of Swiss cheese, which is cooked to 42-43° R. See Thermometers.

Rind—The surface or outer coat of a hard cheese which is usually drier and harder than the interior portion of the cheese. There is no definition as to the depth of this rind. It has been shown that there is 6-10% difference in moisture between the first 2 mm. layer and the second 2 mm. layer. There is only 1-2% difference in moisture content between the second and third 2 mm. layers. Therefore, in a cheese dried for 24 hours in a drying room at 50-60° F., the rind may be considered to be less than 2 mm. in thickness.

Ripening Agents—Agents such as mammary tissue, tryptic and peptic enzymes and zymogens added to milk or cheese to speed up body breakdown or flavor development.

Ripening in Cheese—Has as its object the development of specific physical and chemical characteristics of flavor, aroma, body, texture and color. The ripening changes are associated with decomposition of proteins, fat hydrolysis, lactose fermentation, changes in acidity and oxygen reduction potential and production of gas. Bacteria, yeasts and molds and enzymes or combinations of these are responsible for the ripening changes. Temperatures and humidities affect these ripening agents and consequently affect the ripening of the cheese. Practically all the chemical changes that take place in the process of ripening cheese are in the protein chiefly because the compounds make up the constituents which undergo chemical change. 1. Calcium paracaseinate is formed from the calcium caseinate in the milk as a result of rennet action. 2. Monocalcium paracaseinate becomes soluble in water and sodium chloride. 3. Proteins in the presence of water form (a) caseoses, sometimes called proteoses or albumoses, (b) peptones, (c) amino acids, (d) ammonia and carbon dioxide.

Ripening Milk for Cheesemaking—The development of acid in milk, after it is received and until the rennet is added, is

known as ripening. This ripening is usually brought about by the addition of starter and normally takes about an hour.

Roller—A roll approximately 3 inches in diameter used for stretching and kneading Italian cheese of the *Pasta Filata* type.

Running the Whey, (Canadian)—See **Dipping**.

Salt Soluble—A term applied to a fraction of the cheese protein which is soluble in salt solution at certain stages in ripening.

Salting Out—A term used in cheesemaking meaning to precipitate. The same meaning is also used in bio-chemistry for precipitation of protein compounds by high concentration of salts.

Sampling Cheese, A.O.A.C. Method—When cheese can be cut take a narrow wedge-shaped portion extending from the edge to the center. Cut this segment and grind three times. When cheese cannot be cut take sample with a trier. If only one plug can be obtained take it perpendicular to the surface at a point $\frac{1}{2}$ distance from edge to center and extending either entirely or half way through. When possible draw three plugs one from center one from point near outer edge and one from point half way between the other two. These samples are then ground.

Core Sampling Method—The preferred sample of Cheddars is obtained by drawing two plugs one from the top and the other from the bottom. Each plug extends perpendicularly halfway through the cheese. The $\frac{1}{2}$ inch rind is not included. These samples from one Cheddar give the closest approximation of all the cheese in the vat lot.

Saran—The trade name for a plastic film for wrapping cheese and in which it is cored.

Scalding, (cheese)—An English term for cooking the curd and whey.

Scale Board—A piece of thin wood veneer put in the bottom of cheese boxes and also on the top of the cheese to prevent the cheese from sticking to the box.

Scaring the Milk—See **Shock Treatment of Milk**.

Schotte—Boiled clarified whey often used for cheese starters in some countries.

Scoop—A device used to cut the curd horizontally in the manufacture of Swiss cheese.

Score Card, (cheese)—

Flavor	45—No Criticism	40	45
	Normal Range	35	42
Body & Texture	30—No Criticism	29½	30
	Normal Range	26	29½
Finish	15—No Criticism	15	
	Normal Range	14	15
Color	10—No Criticism	10	
	Normal Range	9	10
Total	100		

For specific criticisms under the headings Flavor Finish etc. see Flavor Finish Body and Texture etc.

Sectionometer, (English)—An instrument which measures the force needed to cut a product by means of a taut wire.

Senses Test, (New Zealand)—An organoleptic (smell & taste) examination of the cheese by the person who grades.

Separating Drum—A perforated rotating drum which formerly was extensively used to separate curd and whey.

Shelf-cured (forced-cured fast-cured warm-cured)—Cheese is cured at 50-60° F. for approximately 3 months. Cheese so cured has a high flavor and is in demand for processing.

Shelf life—This refers to the length of time a cheese product may be kept on a retailer's shelf without developing any defects. For instance a cheese product may develop mold become bleached in color or dried out before it is sold to the consumer.

Most cheese products are tested in the laboratory for shelf under the adverse conditions of temperature humidity and light which might be expected in a retail store.

Shock Treatment of Milk, (Scaring the milk)—A heat treatment of milk less than pasteurization. Such a treatment destroys some of the undesirable organisms and gives the cheesemaker more control over his operation than with raw milk. It is believed that some of the enzymes or bacteria which produce a typical raw milk flavor are not destroyed.

Short Held—American cheddar is classed in this manner if it is from one to six months old.

Shot Holes—In cheese smooth spherical openings with smooth walls about the size of B.B. shot.

Shotty Curd—The firmness of the curd which feels like shot during cooking.

Shrinkage of Cheese—Shrinkage is the loss of weight of cheese during curing. The amount of shrinkage is dependent upon: temperature of curing, relative humidity, the use of paraffin on the cheese and the moisture content of the cheese. Paraffined cheese under normal curing conditions undergo about a 2% shrinkage in six months.

Single Strain Starter—A culture consisting of one strain of the lactic organism as compared with a mixed strain culture.

Sizes of Cheese—See Cheese—Size of.

Skewered—See Punching.

Smear Growth—After salting, when the cheese is placed on shelves, under proper temperature and humidity conditions, a smear develops on the surface of the cheese. This surface slime or smear may be caused by the growth of film yeasts and *Geotrichum candidum*. This mold apparently consumes enough of the acid present to present a favorable media for *Bacterium linens*. *B. Linens* produces an orange pigment. It also produces the enzymes which diffuse into the cheese and impart the characteristic flavor. Limburger and Brick cheese are two examples of a smear-ripened cheese.

Smear Ripened—The ripening action of the slimy, reddish or reddish-brown, surface growth which is found on cheese such as Brick and Limburger when held in a humid room. Yeasts develop first on the cheese surface followed by *Bact. linens* in 6 or 7 days. The yeasts raise the pH to a point where *Bact. linens* can grow. This organism apparently plays a role in the ripening, aids in protein breakdown and flavor development and aids in production of color at cheese surfaces.

Soaked Curd Method—A method of making Cheddar cheese. The curd is covered with cold water and allowed to soak from 10 to 30 minutes before salting, in order to remove so-called undesirable impurities left by the whey. Although the yield of cheese is increased by this added water, the resulting cheese is usually weak and pasty in body, poor in texture, and lacks some of the normal milk constituents, such as milk sugar, calcium phosphate, and other soluble calcium salts which have been dissolved in the soaking process. The disadvantages seem to outweigh the advantages in this method of cheesemaking.

Sorbic Acid—An antimycotic agent which is impregnated in film wrappers for consumer cuts of cheese. The only mold inhibiting product thus far approved by the Food and Drug Administration for general use.

Sounding, Spooning—Rapping or thumping the cheese with the fingers may be done at early turnings to detect whey pockets. These pockets may be removed if detected soon enough. Sometimes called spooning as the cheese may be sounded with a spoon. See Thumping.

Speed Knife—A long, thin spatula, which is inserted between the bandaged cheese and the hoop and pulled around the hoop to loosen the cheese from the hoop after pressing.

Spinning—A term which applies to the stretching and pulling of Pasta Filata curd.

Square Prints—A style of Cheddar cheese usually 5 or 10 lb. in weight.

	Size of Cheese	Weight of Cheese
5 lb. sq. print	4½ x 9 x 4	5 lb.
10 lb. sq. print	7 x 13¼ x 3	10 lb.

Stalhing—An English term relating to the punching of Stilton cheese. See Punching.

Stabilizers—When used in Processed cheese, tend to hold moisture although some of them act as emulsifiers. Where legal, some of the following stabilizers have been used in cream cheese and cheese spreads: locust bean gum, pectin, sodium alginate, caroh or locust bean gum and gelatin.

Standards, Cheese and Cheese Products—See Reference Section P. 292.

Starched Circle—The circular starched cheesecloth which covers the ends of cylindrical styles of cheese.

Steapsin—An enzyme added to milk or curd in the making of Blue cheese.

Steinecker Cheesemaking Machine—The trade name of a German cheese vat which has been used to make Tilsiter, Camembert and Edam cheese. This large circular vat holds 11,000 lb. of milk and is 7 feet in diameter. The rotating, driving mechanism is in the center of the vat to which may be attached agitators and cutting knives. Part of the whey may be withdrawn from an opening in the side of the vat. A cover may be placed on the vat and a vacuum may be drawn in the vat. The curd and whey may be removed to the hoops by the release of vacuum. This vacuum release of curd and whey is supposed to remove the curd without damage.

Stenciling—The act of marking a cheese with edible indehible ink. Each cheese must be marked as to grade, date of manufacture, vat and factory number.

Stirred Curd Method—A method of making Cheddar cheese exclusively used for many years in America. It is also called the Granular Process. It differs from the cheddar method in that (1) the curd remains longer in the whey to develop more acidity and firmness, (2) after separation from the whey the curd is transferred to a curd sink and stirred frequently to keep the small pieces separate instead of being packed and cheddared, (3) the time between removal of whey and salting is much shorter, and (4) the time between salting and pressing the curd is much longer.

It is much more difficult to make cheese of perfect texture with the stirred curd method, and while this method may produce cheese which is a little higher in moisture content, undesirable fermentations are less easily controlled than in the cheddar process.

Stirring Out—A process in Swiss cheese making during which the curd grains are dried out so that a sample taken between the fingers will break into grains again. This process usually requires 30-40 minutes just prior to draining whey.

Strainer, Colby—A large semi-circular perforated strainer which fits the inside of a cheese vat. This strainer is approximately the height and width of the vat and is held in place by arms which fit onto the side of the vat. This strainer can be moved to any position in the vat.

Strainer, Gate—A circular perforated metal strainer placed inside the vat at the opening to prevent the loss of curd.

Stretch in Cheesemaking—The act of pulling or stretching a Pasta Filata cheese. The stretch may refer to the length to which the curd may be extended after dipping in water at 160-170° F.

Stretchable Wrapper, Stretchable Film—A plastic film which must be used in the making of rindless Swiss cheese. This wrapper is placed on the cheese after brining and before the cheese goes in the warm room. The film stretches as the normal gas formation develops and is pulled tight by the expansion of the cheese which is then cured in this wrapper.

Stripcoating—A name which has been applied to a plastic-coated wax covering for consumer cuts of cheese.

Surface Ripened—See Smear ripened.

Sweet-cured—Cheese that is made of cows milk, set sweet with rennet, and cooked rapidly to a very firm consistency.

Swiss, closed surface—A sound rind having no checks or cracks penetrating the body of the cheese.

Swiss Cheese Cultures—*L. bulgaricus*, *L. helveticus*, *L. casei*, *S. thermophilus*.

Swiss Cheese, Set—The number of eyes per trier or in a given area of the cheese.

Swiss Harp—A curd knife, shaped like a harp, used to cut the curd in the manufacture of Swiss cheese.

Swiss Kettle—A large semi-circular copper cheese vat used to make Swiss cheese. These kettles have a capacity of 600 to 3000 lb of milk and one cheese is made from each kettle.

Syneresis—The shrinking of a gel with the expulsion of a free liquid. In cheesemaking, after cutting the curd and with an increase in acidity and temperature, the paracasein fibrils become more and more dehydrated and whey is expelled. This shrinking is an example of syneresis. Popularly called "weeping."

Taping—Placing a plastic tape on fiber boxes of uncured cheese to help develop a pressure pack.

Tears—The term applied to the liquid which is often found in the eyes of aged Swiss cheese. This liquid is thought to be due to proteolysis (chemical changes in the protein).

Telescopic Hoop—A tapered hoop for cheese which is smaller at the bottom. During pressing the pressure is transmitted to all the cheese in the press, the bottom of one hoop acting to press the cheese in the succeeding hoop.

Tempering Room—A room at approximately 60-70° in which the cheese is held for 48-72 hours before processing.

Thumping—An act performed by a grader of Swiss cheese. Thumping is done to locate the eyes or absence of eyes in the cheese. This is done by rapping the cheese with the fingers. The presence of eyes in the interior of the cheese produces a hollow sound. A blind cheese will not emit the same sound. (See Sounding.)

Tiltable Vat—A vat which can be tilted to aid in whey drainage. Due to the size of present day vats, these tiltable vats are not used to any appreciable extent.

Toggle Vat Gate—A sliding gate valve held in place by springs which were used on the front end of old-style cheese vats.

Trommel—A large rotating drum-like device which looks like a cement mixer and is used by the Australians to separate the curd from the whey during the cheddaring operation. This device also performs the "stirring out" operation.

Turning Cheese—The act of turning cheese on the press tables as with Swiss, or on the draining tables with Brick.

During drying the cheese is turned to form a rind on all surfaces before paraffining.

During curing the cheese is turned to prevent rind rot on the bottom surface.

Ultrasonic Aging—Ultra-high frequency sound waves have been found to accelerate the development of flavor and body breakdown of cheese.

Valve-vented Cans—These have been used for curing cheese. The cans have a valve which permits the release of carbon dioxide from the can but prevents the ingress of air.

Vat—The container, preferably of stainless steel, in which milk is converted into cheese. These vats may range up to 20,000 lb. capacity. They are usually steam or hot water jacketed, have mechanical agitators and a gate at the front end for the escape of whey. The cover which fits over and protects the milk in the vat from dust and insects may be of cloth (supported by wooden rods), single service paper or stainless steel.

Vat Lot—A term which refers to all the cheese made from one vat of milk at one time.

Vertical Curd Knife—A curd knife with vertical wires evenly spaced for cutting the coagulated curd in the desired size $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$ inches, etc.

Vitamins in Cheese, (per lb.)—See Vitamins.

Warm-cured, (forced-cured, fast-cured, shelf cured)—See Shelf Cured.

Warm-curing—The process of curing cheese at 55 to 60° F. for 6 to 18 weeks.

Warm-up—The warming of natural cheese packed in plastic film. This process causes a slight "oiling off" which results in a greater adhesion or cling between the wrapper and the cheese.

Washed Curd Method—A method of manufacturing Cheddar cheese in which the excess acid is washed out of the curd with a limited amount of water. This is done after milling and if not carefully controlled will lower the quality of the cheese. Consequently it is not a recommended method. Also called Soaked Curd. See Washed Curd cheese.

Federal Standards: Moisture, not more than 42%; Fat not less than 50% in the solids.

Washing—Water is used to wash curd to remove excess acid as is the case with Cottage cheese and too-acid Cheddar curd. Lactose is removed from the curd by diffusion where a great deal of acid development is not desired as is the case with Brick cheese. Smear-ripened cheese is washed on the shelves with a saline solution to keep down undesirable molds.

Water Pack—Green or cured cheese is printed, wrapped in heat-sealing foil or pliofilm, packed in a water tight container and covered with water.

Wax, Paraffin—The by-product of the petroleum industry which is used to coat cheese, in order to prevent mold growth, moisture loss and insect infestation. A paraffin wax or a micro-crystalline wax is generally used. Mixtures of waxes can be obtained having different characteristics of resistance to water vapor, flexibility, brittleness and hardness, and with melting points from 125-200° F. Polyethylene can also be used as a component of a cheese coating.

Wheel—A term applied to a cylindrical shaped cheese, especially the large, heavy "wheels" of Swiss cheese.

Whey—In cheesemaking, the serum which is separated from the curd after coagulation. Whey composition varies with different types of cheese, for instance, Cheddar, Swiss or Cottage cheese whey.

Average composition	Cheddar Cheese Whey
Water	93.40%
Fat	.35%
Casein	.10%
Albumin	.75%
Milk sugar	4.80%
Ash	.60%
Total solids	6.60%

Whey Off—An English term for dipping the cheese.

Wicking Action—The action performed by cheese bandages in wicking off the surface moisture and closing up the surface of the cheese. If some absorbent material was not provided during pressing and forming the moisture would remain in pockets on the surface of the cheese and cause a very irregular surface which would be susceptible to mold growth.

Wire Stirrer—A stick five or six feet long through one end of which a group of wires are worked into a spherical form. This was formerly used for stirring Swiss cheese curd after harping.

Yeasts and Molds in Soft Cheese, Determination of—See Milk Industry Foundation Laboratory Manual.

Yield of Cheese—This refers to the amount of cheese made based on the composition of the milk. The yield may be expressed as number of pounds of cheese per 100 lb of milk, or number of pounds of cheese per pound of fat. The theoretical yield can be calculated (See Cheese Van Slyke and Price) according to the following formula:

$$\text{Yield} = \frac{(0.93 \text{ Fat} + \text{C} - 0.6) 100}{100 - \text{W}}$$

F = Pounds of fat per 100 lb of milk.
C = Pounds of casein per 100 lb of milk.
W = Pounds of water per pound of cheese.
Yield = Pounds of cheese per 100 lb of milk.

The application of this formula is used by comparing yield with the theoretical yield. Tables of yields have been given in the literature.

End of Cheese Terms

Cheese Fly—A dark colored fly whose maggots or larvae live on cheese and other foods and make them unfit for human consumption. The name "Skipper" is given to this larva on account of its ability to jump or skip 3 to 6 inches by bending its body so the ends meet and then suddenly straightening the body. The larva is said to reach a length of 8 to 10 mm while in a dormant pupa state from 8 to 10 days at 50°C. F. The fly hatched from this larva generally lays its eggs on cured cheese. It can be controlled by scrubbing shelves and wood work with hot water and washing powder by disinfecting with chlorine solution or by fumigating the room with methyl bromide. Now uncommon.

Cheese Mite—A small insect scarcely visible to the naked eye. It affects flavor and body of cheese during ripening but does not prevent proper ripening.

Cheese Tests—See Dairy Tests.

Cheesemaking Methods—See Handbook P 151-160.

Cheesy Flavor—See Butter Defects.

Chelating Agent—Also called *Chelates*. Most commonly known chelate is ethylene diamine tetra acetic acid and its sodium salts.

Chelates have a higher sequestering power than do the complex phosphates.

Chelation—The inactivation of a metallic ion by the formation of an inner ring structure in the molecule of the chelating agent, the metallic ion becoming a part of the ring structure.

Chemical Analysis, Soil—See Analysis, Chemical of a Soil.

Chemical Sanitizing Agents, Types of—Only three types of chemical sanitizing agents have sufficiently pleasing odors to permit their use. All others have odors which are objectionable in dairy products. Following are the three types: Hypochlorites, Chloramines, and Quaternary Ammonium Compounds.

Chemical Sterilization—Where heat or steam cannot be used or is not economical, recourse is sometimes taken to chemical sterilization of equipment and water. This process is convenient, cheap, and rapid, but there are many disadvantages such as undesirable odors left in the milk handled under these conditions, corroding effect on equipment and of course also legal objections.

Chemurgy—That branch of applied chemistry devoted to industrial utilization of organic raw materials, especially from farm products as in the use of soybean oil for paints and varnishes and of southern pine for paper pulp.

Cheshire, Cheshire Stilton Cheese—See Cheese.

Chevon—The meat of the goat used as food.

"Chewing the Cud"—See Rumination.

Chhana-Chuvaran—See Cheese.

Chill—To refrigerate. To subject to a moderately cold but not freezing temperature; cold storage.

Chilled Water—Water cooled nearly to the freezing point. It is quite satisfactory for washing butter and for ordinary refrigeration in milk handling in out of the way places where artificial refrigeration is not available.

Chipped Mouth—A break or crevice in the seat or pouring lip of a milk bottle which, when exposed, offers a place for bacterial contamination. A defect of this kind is taken into account in milk judging contests.

Chloramine— $\text{CH}_3\text{C}_6\text{H}_4\text{SO}_2\text{N Na Cl} \cdot 3\text{H}_2\text{O}$. An organic chlorine compound sold in powder form under various trade names for chemical sterilization in dairy work. These products are more stable than the hypochlorites, lose strength less rapidly and are less corrosive. Sanitizing solutions should contain not less than 50 parts of chlorine per million parts of solution. The solution should be in contact with the surface for at least one minute.

Chloramycin—See Antibiotics.

Chloride-Lactose Number in Milk—An expression of the ratio of chloride to lactose in milk.

$$\text{Chloride-Lactose No.} = \frac{100 \times \text{Per cent Cl}}{\text{Per cent Lactose}}$$

This ratio falls in the range of 1.5 to 3.0 for normal milks but increases in milk from infected udders because the chloride content increases and the lactose content decreases.

Chloride, Mercuric—See Corrosive Sublimate.

Chloride of Lime—See Calcium Hypochlorite.

Chlorine—Cl. A greenish-yellow, poisonous, gaseous element used in dairy work as a disinfecting agent. It may be used as liquid chlorine or in the form of calcium-hypochlorite or sodium-hypochlorite solutions. Dairy utensils are treated with it either by spraying or by immersion. Rinse solutions for farm use should contain approximately 200 parts of available chlorine to one million parts of water. This strength solution is also recommended for spraying in milk plants. A dilution of 100 parts per million available chlorine is sufficient for a rinse in milk plants.

Chlorine disinfectants operate by reason of their ability to give off chlorine which induces oxidation in all organic matter with which it comes in contact. Continued use of the same chlorine solution soon renders it inactive.

Chlorine in the form of its ion, Cl^- , is also a constituent of milk — (approximately 0.10% in fresh milk).

Chlorine for Water Sterilizing—In places where water of accepted purity standards is not available, water supply can be made satisfactory by chlorine treatment. The ordinary hypochlorite used for chlorine disinfectant contains about 10% available chlorine and about 10 p.p.m. should be added to the water.

Chlorine Solution Strength, Test for—See Laboratory Manual (Milk Industry Foundation).

Chlorine Sterilization—Chlorine solution for sterilizing tank cars and trucks, a method more convenient than steam sterilization. The solution is applied by means of spraying equipment. Chlorine is more advantageous than steam because bacteria will not reproduce on a chlorinated surface.

Chlorophyll—The green pigment in plants which is formed in the cell in the presence of light and available iron. It absorbs light and is active in photosynthesis (the process by which a plant is able to form starches and sugars).

Chloroplast—One of the numerous special bodies in plant cells that contain chlorophyll.

Chocolate, (U. S. Standards)—"The solid or plastic mass obtained by grinding cocoa nibs without removing any constituents except the germ. It must not contain more than 3% of ash insoluble in water, 3.5% of crude fiber, and 9% of starch, nor less than 43% of cocoa fat."

Also called liquor chocolate and chocolate liquor.

Chocolate Coating—Coating for ice cream products.

Chocolate Flavored Powder—Stabilized non-settling product for making chocolate flavored dairy drinks. Requires added sugar.

Chocolate Flavored Syrup—Stabilized non-settling product for making chocolate flavored dairy drinks. Contains sugar.

Chocolate Liquor—The solid or plastic product obtained by grinding cocoa nibs. Chocolate liquor contains about 50% fat. Also known as liquor chocolate, plain chocolate and chocolate.

The colored liquor may be molded and put up in large or small slabs or packages such as are sold in grocery stores as bitter cooking chocolate or it may be further processed into cocoa.

Chocolate Milk—See Milk.

Chocolate Syrup Preparation—See Ice Cream.

Choice Grade Beef—See Beef Carcass Specifications.

Cholera Infantum—See Infantile Diarrhea.

Cholesterol— $C_{27}H_{46}O$. A sterol found widely distributed in nature. It occurs in milk to the extent of 0.3 to 0.4% of the milk fat in which most of it is dissolved.

Choline— $HOC(=O)CH_2N(CH_3)_3$ —An important

water soluble non protein nitrogenous constituent of milk. Milk contains about 150 mgms of choline per liter. A small portion of the total choline of milk is present in combined form in phospholipides such as lecithins and sphingomyelins. See Vitamins.

Chopped Hay—See Feeds and Feeding.

Chorion—The outer sac of the fetal membranes which fills the cavity of the uterus. The chorion of the cow is attached to the cotyledons lining the uterine wall through finger-like processes or villi. Through these areas of attachment forming the placenta nutrients and waste products are exchanged between dam and fetus through the mechanisms of osmosis and active transport.

Christiana Cheese—Christian IX—See Cheese.

Chromatin—In genetics a protoplasmic material in the nucleus of cells regarded as the physical basis of heredity. In the resting state of the nucleus it exists as small granules strung out in a long thread supported on the network of *linin* (the other part of the nucleus). When the cell starts to divide the chromatin thread shortens and finally breaks up so that when cell division is completed each cell will contain the number of chromosomes characteristic of the species.

Chromatin is so called because it readily becomes stained by certain dyes. See Chromosome.

Chrome Itch—A burning or itching sensation sometimes occurring on the skin of dairy plant workers who have had direct and prolonged contact with brine to which sodium dichromate has been added as a corrosion preventative.

Chrome-Nickel Steel & Chrome-Nickel-Iron Alloys—See Stainless Steel.

Chrome Steel, (Chromium Steel)—Generally about 18% chromium, 8% nickel alloys of which Allegheny metal Retinal (sometimes called *k.A.*) are among those that are used extensively as dairy metal. They are nearly insoluble in milk. They clean easily and have an attractive appearance.

Chromogenic Bacteria—A non-spore forming bacteria which may develop pigments that give the colony a definite coloration. While not forming distinct groups in other respects on the basis of pigment or color production alone they may be classified as follows:

1. *Chromophorous* bacteria whose pigment is analogous to chlorophyll in higher plants; i.e. the pigment is an integral part of the protoplasm.
2. *Chromoparous* bacteria which excrete pigment either as a color body or a leuco body which colors on reacting with atmospheric oxygen.
3. *Parachrome* bacteria which retain the excretory pigment within the cell body.

In milk blue coloration is most common and is caused mainly by *Bacillus cyanogenes* or *Bacterium syncyanum*. Acidity favors this color production. Red pigmentation is less common in milk and develops less rapidly than blue color so that the milk is delivered to the consumer in apparently good condition. *Bacillus prodigiosus* is most frequently the causative organism. Yellow milk is very uncommon and is usually caused by *Sarcina lutea*. Also called chromobacterium.

Chromosome—One of the small bodies usually definite in number in the cell of a given species and often more or less characteristic in shape into which the chromatin of a cell nucleus resolves itself before the cell divides.

Chuck—A part of a side of dressed beef including some of the neck and the parts about the shoulder blade also including the meat on the first three ribs.

Chuck Rib—A term given to a cut of beef comprising the three to five ribs included in the chuck.

Churn—See Butter.

Churn, Cleaning of—See Butter.

Churn Test—See Dairy Tests.

Churned-Cream Buttermilk and Churned-flake Buttermilk—See Milk, Buttermilk.

Churning—See Butter.

Churnmilk—See Milk, Buttermilk.

Churns, Continuous—See Buttermaking, Continuous Process.

Chute—A narrow and high walled passageway or specially built stall for holding or restraining animals, generally cattle for de-horning or branding.

An enclosed opening through which material may be passed to a lower floor for convenience in handling hay or grain.

Now often displaced by belt-driven, chain cups or by blowers which elevate the food material to top floors from which it is easily delivered through spouts to feed carts where needed.

Chyle—The digested alkaline fluid resulting from the action of the biliary and pancreatic juices upon the chyme which is thus prepared for absorption by the lacteals of the intestines. It passes mixed with the blood into the veins by the thoracic duct.

Chymase—An enzyme usually obtained from the inner lining of the fourth stomach of young calves and lambs although it is widely distributed in other animals and in extracts from various plants. The chymase of mammals is usually called rennin. The extract containing the enzyme is known as rennet and is used in the manufacture of cheese. See Rennin.

Chyme—The semi-liquid food mass, after digestion in the stomach, as it passes into the small intestine to be acted upon by the bile and pancreatic juices.

Chymosin—See Chymase.

Cieddu—See Milk—Fermented.

Cilia—Fine hairs having wavelike motion, as in the nostrils, to aid in expelling foreign material, mucus, etc. Cilla in microorganisms. See Flagella.

Ciliate—Fringed with hairs or fine teeth.

C.I.P.—Cleaned in-place; a method of cleaning equipment and sanitary pipe lines without dismantling, by pump circulation of washing solutions.

See "In-Place-Cleaning of Pipe Lines" in Handbook P. 201.

Circulation—The movement of the blood through the arteries, veins and capillaries of the body, caused by the beating of the heart, so that the blood may supply nutriment and oxygen to all parts of the body and carry the carbon dioxide and other waste products to the excretory organs.

Cistern—A reservoir or tank, usually artificial, though sometimes natural, for holding water or other liquids; sometimes underground.

Citrate—A salt or ester of citric acid. Milk contains citrates (salts) equivalent to .15 to .30% citric acid. Citrates are of importance as stabilizers against heat coagulation because they tie up calcium and magnesium as soluble unionized complexes. Citrates are also important precursors of flavor compounds in cultured buttermilk and in cream for buttermaking.

Citric Acid— $C_3H_5O_7$. An organic acid found mainly in the juices of citrus fruits. It is a tribasic acid, containing three carboxyl groups. Milk contains salts of this acid equivalent to 0.15 to 0.30% citric acid.

Citrin—See Vitamins.

Citrus By-Products—See Feeds and Feeding.

Clabbered Milk—See Milk—Fermented.

Clarification—The process of cleaning milk by use of a centrifugal machine known as a clarifier. See Clarifier.

Clarified Butter—See Butter.

Clarified Milk—Milk which has been passed through a clarifier to remove any dirt or other foreign material.

Clarifier—A centrifugal machine used in milk plants to remove dirt or foreign matter from milk. It is more efficient than a filter and also takes out most of the leucocytes, body cells and considerable numbers of bacteria as well as other sediment. It is considered essential in the processing of homogenized milk, because any sediment which would usually rise with the cream would settle to the bottom of the bottle as a visible and very undesirable deposit in homogenized milk if the milk had not been clarified.

Clarifier Slime—The dirty gray viscous material which collects in the bowl of the clarifier during the clarification of milk. It is made up of dirt, body cells, bacteria, particles of casein, fat and other materials.

Class (in livestock)—A group of animals ranked together for judging or showing or comparing common characteristics, example a class of dairy cattle of the same age and breed.

Class Project, (agriculture)—A project in agriculture conducted by a number of pupils in a class or several classes under the supervision of an instructor. See Project, agriculture.

Classification—An arrangement of animals or plants such that the members of any group resemble each other in some respects, i.e. possess a common quality while differing in the same respects from members of the other groups. That is the comprehensive (broadest) group must include all the divisions and sub-divisions exhibiting that common quality. The accepted order of arrangement by subdivisions is phylum, class, order, family, genus, species, subspecies, or variety and strain (strain is sometimes used in designating domestic animals).

Classification of Cattle for Type—The placing of a type score on the individual animals in a herd by an experienced and capable classifier. The animals are ranked as excellent (score 90+) very good (85 to 90) good plus (80 to 90) good (75 to 80) fair (70 to 80) and poor (less than 70).

The Guernsey Association calls the 80-90 score animals desirable and the 75-80 score animals acceptable. In most of the breeds a break down score card is used whereby all the parts of the animal are scored and given a classification.

Clay—Mineral soil particles less than .002 mm in diameter. A soil containing much clay.

Clay Pan—See Hardpan.

Clean-bred—Purebred.

Clean Herd—A term generally applied to a dairy herd free from disease and in good healthy condition.

Clean Milk—Can be interpreted roughly that the milk is produced from clean and healthy cows, that the utensils are clean and such methods are used as will produce low bacteria count milk and an absence of foreign material in the milk. It should be cooled as quickly as possible after it is produced. See Handbook P. 60-69.

Cleaner—See Washing Powder.

Cleaning Materials and Their Application—See Handbook P. 18.

Cleaver—A butcher's tool used for cutting animal carcasses into joints or pieces.

Climbert Cheese—See Cheese.

Climatic Physiology* is concerned with the ways that meteorological factors—dry bulb temperature, humidity, sunshine, wind, snow, rain—affect animals directly and indirectly by the climatic effects on soils, crops, parasitic and microbial infestations and infection, and also by the climatic effects on the farmer on his energy, progressiveness, mores and morals. Cattle like other species that developed in a given climatic region evolved by natural selection unique hereditary morphological (visible) and neuroendocrine (not visible) characteristics which harmonize them with their environment. European-evolved cattle are essentially arctic species that tolerate temperature of -40°F or lower. Therefore cattle (unlike man) need no protection against cold as such, but only need properly exposed draft free open sheds for protection against snow, rain and wind. European-evolved cattle however need protection against heat, especially beating radiation. Combination of shade, cool drinking water, full utilization of natural breezes and showers activated by photocells which cattle learn quickly to use, are suggested for hot weather. Current studies in climatic physiology are intended to furnish basic data needed for a) animal shelter against heat and cold, b) selection of individuals most suitable for given climates, c) developing new breeds of cattle suitable to given climates, and d) obtaining insights into mechanisms which control body temperature and related processes.

In contrast to European Indian-evolved cattle (Zebu or Brahman) are rather heat tolerant and cold intolerant. This is shown by the fact that at 7°F cold tolerant Holsteins increased heat production only 2% above that at 50°F while Zebu increased heat production 60%. This is also shown by the fact that the "comfort zone" (when no demands are made on temperature regulating mechanisms) of European-evolved cattle is 50° to 60°F and of Indian cattle 50° to 80°F —a 20°F difference. The rectal temperature begins to go up (temperature regulating mechanism begins to

*Courtesy of Dr. Samuel Brody, University of Missouri, Columbia.

fail) at 75° F. in European cattle and at 95° F. in Indian cattle.

While more heat and insect tolerant, the Indian cattle are less productive. When Indian and European types of cattle are crossed, their genes recombine into new patterns, and in some cases—by skillful selection—the progeny, obtained by combining the best of both parental breeds, may be superior to both parents (transgressive variation). This way it is possible to develop breeds of cattle that combine the productivity of the best European and the heat and pest tolerance of the best Indian cattle. The King Ranch succeeded in doing just this for their Santa Gertrudis cattle.

Acclimatized European cattle are cold tolerant and are not in need of protection against cold as such but only against wind, snow and rain. They do need protection against heat. These findings show the practicability of loose-housing methods that have evolved in recent years and are now being commonly used by Northern dairymen.—

Cling, (cheese)—See Cheese.

Clinical Mastitis—See Diseases in Cattle.

Clipped Oats—Clipped Oat By-Product—See Feeds and Feeding.

Clippers—Apparatus designed for clipping the hair of cows or for cutting wool from sheep. One type is designed for clipping horns. They are both machine and hand powered.

Clipping—To clip the hair of an animal either over the entire animal or over a part of the animal. With dairy cows it is important for sanitary reasons to clip the udder, the belly, and the rear portion of the cow. This removes the long hairs so that the cow can be kept cleaner and there are no long hairs to dump into the pail.

Animals are often clipped to prepare them for a show or sale.

Clod—A portion of the shoulder of beef. A lump of hardened earth.

Close Breeding—A form of inbreeding; opposed to line-breeding. Breeding closely related individuals, such as full brother and sister, sire and daughter, or dam and son.

Close Texture Cheese—See Cheese defects.

"Closed" Base Plan—A certain quota of milk is established by a producer in one period and is maintained for several years. This plan restricts the volume of milk for

which any producer may receive the base price of a volume that he produced in a previous period. See Basic Surplus Plan and Open Base Plan.

Closed Cycle—Any cycle in which the primary medium, such as ammonia, or sulfur dioxide in a refrigerating system, is always enclosed and makes repeated cycles.

Clostridium Perfringens—See Cheese.

Clotted—See Coagulated.

Clotted Cream—See Milk and Cream.

Clotting—The formation of a smooth gel or curd in a colloidal sol. For example, the clotting of the casein of milk by the action of rennin.

Clotting Milk—An old term which refers to the coagulation of milk.

Cloudy Brine—See Butter Defects.

Cloven-footed—Having the foot divided into two or more parts, as in cattle and sheep.

Clover—See Feeds and Feeding.

Club Cheese—See Cheese.

Club Wheat—See Feeds and Feeding.

Clumping—The forming of aggregates or clumps of fat globules in cold milk. The fat globules coming in contact with one another have a tendency to adhere or form bunches. The degree to which this clumping takes place in milk or cream depends upon temperature, age, heat treatment, fat content and its degree of dispersion, the degree of agitation, and the degree of fluidity of the milk and cream.

Fat globule clumping is a pre-requisite of creaming. It is now thought to be due to the presence of an agglutinin (euglobulin) in the milk serum which is destroyed at temperatures above those used for normal pasteurization.

Fat globule clumping also occurs as a result of homogenization when the fat content is over 8-10% or when the SNF/Fat ratio is less than 1.0. It is the cause of homogenized cream feathering in coffee.

C.M.C.—See Ice Cream.

Coagulant—That which produces coagulation. Heat, acid, rennet and pepsin, and alcohol are said to be coagulants. See Coagulation.

Coagulation—The precipitation of the disperse phase of a colloidal system

The change from a liquid to a curdlike state the process of clotting Milk may be coagulated in any of the following ways

- 1 By enzymes (generally rennet and pepsin for cheesemaking)
- 2 By heat
- 3 By acid
- 4 By alcohol (has a dehydrating action and denatures protein quite readily)

Usually a combination of the first three are employed in cheesemaking

Coagulation Test—See Dairy tests

Coal Tar Food Colors—The following coal tar dyes as described on pages 4 to 6 of Service and Regulatory announcements Food and Drug No 3 are permissible for use in coloring ice cream and other food articles

Red shades

- 80 Ponceau 3R
- 184 Amaranth
- 773 Erythrosine
- Ponceau SX

Green shades

- 666 Guinea Green B
- 670 Light green SF Yellowish
- Fast green FCF

Blue shades

- 1180 Indigoune

Orange shades

- 150 Orange I

Yellow shades

- 10 Naphthol Yellow S
- 640 Tartrazine
- 22 Yellow AB
- 61 Yellow OB
- Sunset Yellow FCF

The numbers preceding the names refer to the colors as listed in the Colour Index published in 1924 by the Society of Dyers and Colourists of England which gives the composition of these dyes Names not preceded by numbers are not listed in the Colour Index. The composition of such dyes will be furnished on application to the Food and Drug Administration.

Coarse Flavor—See Butter and Ice Cream Defects.

Coarse Texture—See Ice Cream Defects

Cobalt—See Feeds and Feeding

Coccaceae—See Cocci The family of bacteria made up of cocci or spherical forms. It includes the following tribes and genera.

I Tribe Streptococceae Genus Diplococcus Genus Streptococcus Genus Leuconstoc.

II Tribe Neisseriae Genus Neisseria Genus Gaffkya

III Tribe Micrococceae Genus Staphylococcus Genus Micrococcus Genus Sarcina Genus Rhodococcus

Cocci—Bacteria which are generally spherical in shape though occasionally they occur as slightly oval or even angular bodies They are non motile non-spore forming and usually non-capsulated They occur singly (micrococci) in pairs (diplococci) in chains (streptococci) in grape like clusters (staphylococci) in groups of four (tetrads) in cubes or packets (sarcinae)

Bacteria usually observed as rods may some times appear as cocci under certain conditions. Some forms are intermediate between cocci and bacilli (coccobacilli)

Cocks—Closures on taps tanks tankers and pipe lines Stainless steel cocks are used on glass and are preferred on all up to date installations

Cocksfoot—See Feeds and Feeding

Cocoa—Chocolate from which about 50% of the fat (cocoa butter) has been removed by pressing The resulting press cake is broken up and subjected to grinding and bolting

For description of plant from which cocoa is derived, see Cacao

Cocoa Butter (Cacao Butter)—A pale yellow product high in fat content removed by pressure from liquor chocolate in the manufacture of cocoa See Cacao

Cocoa, Concentration of Flavor of—See Ice Cream

Cocoa Dutch Process—In the Dutch process the cocoa beans are treated with certain alkalis at the time of roasting to break up the cell structure This alkali treatment makes the cocoa more soluble and gives it the desired darker color which distinguishes Dutch Process from Natural cocoa It also aids in bringing out the full fine chocolate flavor when the cocoa is used in the finished product. Because the alkalis counteract the puckery acid taste which is found in natural cocoa the Dutch Process cocoa leaves no bitter taste when used as flavoring in ice cream.

Cocoa, Natural Process—Made from chocolate liquor by subjecting the liquid to high pressure in hydraulic presses This process

removes a large amount of the cocoa (fat) butter, usually about 38 or 40% of the total, and leaves a hard, dry cake which normally contains about 22% fat, though some cocoas contain more and some less. It also contains nearly all the flavoring material from the cocoa bean. The fat is practically tasteless. This cocoa cake is then put through a number of processes known as milling which results in the finely sifted cocoa.

Cocoa Nibs—Crushed cacao beans deprived of husks and germs and used for the manufacture of chocolate and cocoa. See Cacao.

Cocoa or Chocolate Liquor, Amount to Use in Ice Cream—See Ice Cream.

Cocoa Shells—See Feeds and Feeding.

Cocoloid—A stabilizer of vegetable origin, Sodium alginate sold as cocoloid. See Sodium Alginate.

Coconut—The fruit of the coconut palm (*cocos nucifera*) is one of the most important economic products of the tropics. The large almond shaped fruit consists of an outer brown fibrous husk and the nut which contains the thick meat and the clear milk or water used as a refreshing drink. The husk is valuable as a fiber for matings and thatching, etc. The fresh coconut meat is a valuable food used mostly in shredded form. The dried coconut (copra) from which the oil has been extracted is used as a feed for livestock. See Coconut Oil. See Feeds and Feeding (Coconut Cake and Meal).

Coconut Cake, Coconut Meal—See Feeds and Feeding.

Coconut Oil, Coconut Butter—The oil extracted from the copra (dried coconut) is odorless and nearly colorless when pure and is similar in consistency to butter at ordinary temperatures. In processing the oil three grades are produced: Cochin oil, the finest and whitest; Ceylon oil, the next grade; and Copra oil. These oils are used as substitutes for or adulterants in lard, butter, cocoa butter and in the making of soap and candles.

Cod-liver Oil—See Feeds and Feeding.

Coefficient of Digestibility—The percentage of each nutrient which is digested.

Co-enzyme—A natural, thermo-stable, and often readily removable fraction of an enzyme system which is necessary to the action of that system.

Coffee Cream—See Milk and Cream.

Cohesion—That form of attraction by which the particles of a body are united through the mass.

The property of sticking or cohering. Milk shows most cohesion when cold. The cohesion in milk is due to the sugar, ash, etc. which are in solution in the milk serum, and to the physical state of the fat and casein.

Coil Vat—See Milk, Processing and Processing Equipment.

Coitus; Coition—The act of mating, or sexual union. Copulation.

Colby Cheese, Standards—See Cheese.

Cold-cured Cheese—See Cheese.

Cold, Effects on Milk—Refrigeration and low temperature play a prominent part in milk processing. Low temperatures decrease the ability of bacteria to grow and greatly help to keep the milk sweet and check the production of acid producing germs in the milk. Cold temperatures also aid in the clustering and separation of the fat globules.

"Cold-milk Separators"—See Milk, Processing and Processing Equipment.

Cold-pack Cheese Food; Cold-pack, Cluh, Comminuted Cheese; Cold-pack Cream Cheese. —See Cheese.

Cold Packed Fruits—Fruits which have been stored at freezing temperatures after the addition of sugar, generally at the rate of one pound of sugar to two or three parts of fruit. The fruit-sugar mixture is packed in sealed containers, quickly frozen at 0° to -15° F. and held at freezing temperatures until ready for use. Cold packed strawberries and raspberries are widely used in the ice cream industry. Their flavor is generally considered to be equal, or in some cases superior, to that of fresh fruits.

Cold-Pressed Cottonseed Cake—See Feeds and Feeding.

Cold Shock—See Temperature Shock.

Cold Wall Storage Tank—A storage tank in whose walls are circulated a refrigerant—ammonia or freon.

Coliform Group Bacteria—A group of non spore forming motile aerobic, and facultative anaerobic gram negative gas-forming lactose fermenting bacilli which play an important part in water milk and general food sanitation. The organisms of the coli division (*Esch coli*) are predominately of fecal origin while those of the aerogenes type (*aerogenes aerobacter*) are found most often in soils grains etc. They are nearly always present in milk as it leaves the stable even under the most careful methods of production. They are always undesirable in milk or dairy products since they produce acid and gas and many objectionable odors and off flavors.

The bile salt test for this organism is used to detect fecal pollution in milk and water supplies. See Bile Salt Test.

Coli Incubation Test—See Bile Salt Test.

Collagen—A gelatinous protein which is the chief constituent of the bones and tissues in the sinews lips head knuckles and feet of animals the parts used in the manufacture of glue and gelatin.

Glue is used in the woodworking industry as well as for many other purposes.

Gelatin is used in the baking and ice cream industries for capsules in medicine for coating of pills photography and cultures for media.

Colloid—A dispersion system in which particles between one millimicron and $\frac{1}{2}$ micron in diameter are suspended in a continuous phase of some other substance. Cream is an example of a liquid with fat globules suspended in another liquid water. In butter it is the fat which provides the continuous phase enclosing droplets of water as the disperse phase. Liquids suspended in liquids are called emulsions while solids in liquids are called suspensions. Suspensions may be classified as sols or hydrosols capable of forming apparently homogeneous solution and jells or hydrogels which are semi-solids. The particles are generally aggregates of molecules but may also be extremely large molecules such as those of albumen. Colloids are roughly differentiated from true suspensions or the so-called "crystalloids" by failing to pass through a membrane. Also the hydrates of colloidal suspensions are gelatinous while those of crystalloids are crystalline.

Colloidal Material—A mixture of material in such a very finely divided state that the particles will not settle out. The particles lie in size between the limits of visibility

under a microscope on the one hand and invisible molecules on the other.

In soil colloidal material is made up of the finer clay particles and much of the organic matter.

Colloidal Sol—A colloidal suspension or dispersion.

Colloidal System—A system consisting of one phase dispersed in another to such a degree that the surface forces become the predominant factor in determining its properties.

Colloidal Viscosity—Viscosity due to the swelling of submicroscopic particles in solution. Also called apparent viscosity.

Colon Test—See Dairy Tests.

Colony—A collection or group of bacteria in a culture derived from the multiplication of a single organism and visible to the naked eye.

Color, (Dairy Products)—There is a marked difference in the color of milk due to breed characteristics. For instance the Guernsey milk has a characteristic high yellow color whereas the Holstein milk has more of a bluish color. Although the color is more or less affected by the nature of the feed given the cows there is also considerable difference due to the season of the year. The milk of cows on pasture or other green feed will have more of the yellow color than cows fed on dry feed. The color of butter and cheese products is generally made uniform by the addition of annatto (coloring matter).

There are some color defects that are noticed from time to time. These are generally due to molds yeasts and bacteria. There are also some spore formers that may produce objectionable colorations. See Handbook p.

Color and Flavor Combinations Color and Flavor, Harmony In—See Ice Cream Fancy Molded.

Color Fermentation—An abnormal fermentation produced in milk or cream resulting in color changes. Many organisms commonly found in milk produce colored bacterial colonies especially yellow orange or red on agar and various other solid media. See Chromogenic Bacteria.

Color in Ice Cream—See Ice Cream.

Color Specks—See Butter Defects.

Colostrum—The milk secreted by the mammary glands during the first few days of lactation. Colostrum is thick and yellow, has a strong odor, a bitter taste, and contains a very high percentage of globulin. Colostrum has a laxative effect and is especially valuable for the young calf. In two to ten days colostrum milk usually changes to normal milk. Colostrum is believed to be especially rich in antibodies which protect the calf from diseases to which it would otherwise offer little or no resistance. For Composition of Colostrum see Milk and Cream.

Colza Oil Meal—See Feeds and Feeding.

Combination Plan for Buying Milk—A combination of the basic surplus plan and the classification or use plan. The combination plan considers both the use to which the milk is put by the dealer and the volume of milk produced by the individual farmer.

Combined Churn and Worker—See Butter.

Come-up Time Pasteurization—See Milk, Processing and Processing Equipment.

Comfort Stall—A stall designed to give more comfort to the cow than an ordinary stall. It is wider and has a series of horizontal pipes over the manger which serve to keep the cow back in her stall when standing idle, but which allow her to go forward when eating or lying. The cow is tied by a chain fastened to one of these pipes and snapped to the neck strap of the cow. An adjustable cross bar is placed across the rear of the stall to hold the bedding in place. Cows, when in these stalls, remain cleaner and are more comfortable than when kept in other types of the stalls. See Farm Structures in Handbook P. 210.

Commercial Fertilizer—See Fertilizer.

Commercial Grade Beef Carcasses—See Beef Carcass Specifications.

Commercial Mixed Feeds—See Feeds and Feeding.

Comminuting Machine—A piece of equipment used for reducing large pieces of hard or frozen material such as fruits, nuts, pimento and cheese into smaller particles which are easily melted or incorporated into the finished product; i.e. ice cream, pressed cheese, etc.

Commission Cheese—See Cheese.

Common Millet—See Feeds and Feeding.

Common Names of Compounds, Their Chemical Names and Formulas—See Reference Section P. 326.

Common Vetch—See Feeds and Feeding.

Community Breeding—The breeding of only one breed of any particular genus of animal in a community. For example: All breeders in a community breed Jersey cattle, or any other breed, and work together to develop that breed in that community. Communities that can agree on one breed have a distinct advantage in breeding, marketing surplus stock, etc.

Companion Crop—Any crop planted in association with another crop, usually to suppress weed growth; ordinarily a fast growing crop. For example, a cereal grain sown with hay or pasture seed mixture.

Comparison of Thermometer Readings. See Reference Section 322.

Comparison of Water in Milk With Some Other Foods—See Reference Section P. 284.

Compass Saw—A narrow bladed saw for cutting curves.

Compatibility, (genetics)—Said of sex cells. Their ability to unite and form a fertilized egg that can grow to maturity.

Complete Fertilizer—See Fertilizer.

Complex Ice Cream Mixes—See Ice Cream.

Composite Sample—A mixture of single samples of milk or cream, taken from different lots or deliveries, the amount taken each time being in proportion to the amount of milk in the lot or delivery. Composite samples are usually taken for the Babcock test, and the composite sample is tested at the end of one or two weeks; the milk, in the meantime, is preserved by the addition of preservatives, such as bichloride of mercury, bichromate of potash, or formalin. On the dairy farm a composite sample represents the average quality from each milking. If one day's milk is to be tested (for butterfat) no preservative is necessary. The samples are merely mixed in one bottle and tested. If the milk for two or three days is to be tested, one of the preservatives already mentioned is used. Each sample should be in a constant proportion to the yield at each milking.

Composite Sample Bottles—Bottles especially designed for holding composite samples of milk and cream, wide-necked and fitted tightly with rubber stoppers so as to prevent evaporation.

Composition (Approx.) and Weights Per Gallon of Ingredients Used in Ice Cream Mix—See Ice Cream

Composition of Milk—See Milk Composition of

Composition of Milk, Factors Affecting—While the composition of milk reaching the factory from all sources is fairly constant there may be a significant variation in the composition of milk from individual cows and to a certain extent from individual herds. The principal causes of variation in fat content are: 1 Difference in breed 2 Variation due to intervals between milking 3 Habit of individual milkers that is whether or not the cows were milked clean 4 Excitement of cows 5 Season. Contrary to some opinions feed has but little effect on fat content although there may be some marked differences as cows are turned from dry feed to pasture conditions.

Compost—Organic residues leaves grass clippings etc. and soil which have been piled moistened and allowed to undergo biological decomposition. Mineral fertilizers and lime are sometimes added. Often called artificial or synthetic manure.

Compounds—Substances containing more than one constituent element and having properties on the whole different from those which their constituents had as elementary substances. The composition of a given pure compound is perfectly definite and is always the same no matter how that compound may have been formed. See Common Names of Compounds. Their Chemical Names and Formulas in Reference Section p. 396.

Compressed—Flattened.

Compressed Dried Milk—See Milk, Processing and Processing Equipment.

Compression Stroke—The compressing of the gases in the cylinder of an engine after admission but before the working stroke—the second stroke in a four cycle engine.

Compression System—A mechanical system of refrigeration in which ammonia gas is compressed under great pressure and then reduced to the liquid state by passing through a tubular condenser cooled by cold water. The liquid ammonia then passes through an expansion valve into larger expansion pipes where, due to the release of pressure it expands into the gaseous form absorbing a large amount of heat from the surrounding air or brine. The gas is then pumped back into the compressor where the cycle is repeated. See Compressor.

Compressor—A specially designed pump used in the compression system of mechanical refrigeration. The compressor draws the vaporized refrigerant from the expansion coils into the suction side of the compressor compresses it and discharges it under a pressure of 125 to 175 lb per square inch. The refrigerant is thus greatly reduced in volume with a corresponding increase in temperature. Compressors are of two types—the single acting and the double acting. See Refrigeration.

Double Acting Compressor—A compressor having both a suction and a discharge valve in each end of the cylinder. This type of machine will do nearly as much work with one cylinder as a single acting machine will do with two cylinders since while gas is being discharged from one end of the cylinder the other end is being filled with gas at suction pressure.

Single Acting Compressor—A specially designed pump which has only one suction valve and one discharge valve. It is used in compression refrigerating systems to transfer the ammonia from the low to the high pressure side of the working system. The heat of the gas is concentrated by compression and carried off by cool water in close proximity to the gas which then liquefies.

Comte—See Cheese.

Concentrate—See Feeds and Feeding.

Concentrated Liquid Milk—**Concentrated Milk**—**Concentrated Skim Milk**—**Concentrated Sour Skim Milk**—See Milk Processing and Processing Equipment.

Concentrates—Feeds that are low in fiber and high in total digestible nutrients. They include the seed grains and most of their by-products. They may be either low or high in protein.

Concentration—The amount of a substance in weight gram molecules or equivalents contained in unit volume or unit weight.

Conception, (Genetics)—The fertilization of the egg and the beginning of the growth of the embryo within the body of the mother.

Concrete—A mixture of cement sand and gravel with or without broken stone and water. The resultant mixture hardens and the cement binds into a stone-like mass. Much used in fire proof construction.

Concrete Mixer—A power-operated machine for mixing the materials of which concrete is made.

Condensation—This process takes place when a gas (air) becomes saturated with water vapor due to cooling.

Condensed Blend; Condensed Buttermilk; Condensed Buttermilk, Composition of; Condensed Milk—See Milk, Processing and Processing Equipment.

Condensed Milk Butter Fat Test—See Dairy Tests.

Condensed Milk Flavor—See Ice Cream Defects.

Condensed Milk (Whole and Skim); Condensed Skim Milk—See Milk, Processing and Processing Equipment.

Condensed Whey—See Whey, Condensed.

Condenser—1. In mechanical refrigerating systems, the coils of pipe into which gas is forced from the discharge side of the compressor. Water or air flowing over or through these coils removes sufficient heat from the gas to allow it to liquefy and remain under high pressure until it passes through the expansion valve.

2. The piece of equipment attached to the top of a vacuum pan, for the purpose of reducing to water the vapors arising from the boiling milk in the pan. Condensation is accomplished by bringing the vapors in contact with cold surfaces or by passing them through a cold water spray. See Compressor.

Condenser, (Horizontal Shell and Tube)—Also known as "multipass" condenser. Used for smaller units each consisting of a number of tubes in a shell. Each unit is placed one above the other to form a condenser. The water circulates in the tubes, and the ammonia between the tubes and shell.

Condensery—A plant or factory where condensed or evaporated milk is produced.

Condensery Corporation—A condensed milk corporation; a joint stock company without cooperative features. It is an incorporated organization, the stocks of which are purchased by the public at large. Each stockholder is liable only to the extent of the amount of money he has invested.

Condensery, Promoter's—A milk condensery. A joint stock company with cooperative features. Supposedly, the patrons own the major portion of the stock, the object being to give them greater interest in the financial well-being of the condensery, with

the hope of thereby insuring a larger and more permanent milk supply. Not always successful because of over-optimism of promoters and lack of the necessary operating capital.

Condensery, Proprietary—A milk condensing establishment owned or operated or both by an individual or a group of individuals in partnership. The owner or owners usually buy milk at prices based on market quotations for fluid milk prevailing in the territory where the condensery is located. Profits and losses are borne by the condensery and, in the case of partnership, are shared according to the amount of money invested by each partner. Each partner is individually liable for all debts of the firm contracted either with or without his permission.

Condensing—The process of reducing or changing a product by lower temperatures or increasing pressures. Ex: changing steam to water or changing heated milk to a thick liquid by evaporation of part of the water.

Condition—A term in animal husbandry to denote the state of well-being of livestock as regards health and fullness of flesh.

Conductance, (electrical)—The reciprocal of resistance. It is measured by the ratio of the current flowing through a conductor to the difference of potential between its ends. The practical unit of conductance, the mho, is the conductance of a body through which one ampere of current flows when the potential difference is one volt. The conductance of a body in mhos is the reciprocal of the value of its resistance in ohms.

Conducting Tissue—Special cells of the growing plant concerned in the movement of food, water and minerals.

Conduction of Heat—A transfer of heat between bodies that are in close contact with each other, or through the same body.

Conductivity—The power of a substance to receive and transmit heat, electricity, etc.

Conductors—Materials which readily allow the passage of electric current. Copper is one of the best conductors.

Conduit—An insulated waterproof tube generally used to protect electric wires or cables. Also a canal or trough to conduct water.

Conduit Box—The outlet box protecting the junction of electric wires and cables

Conduplicate, (Agronomy)—Folded together lengthwise in the bud as a leaf along the midrib

Cone Pulley—A pulley resembling a cone but in the form of steps used in pairs for varying the r.p.m. of shafts etc.

Confections—Candies and other sweetmeats made with milk or milk by products See Handbook P 176

Conformation—The build or outline of an animal It is dependent largely upon the shape and size of the bones and muscles and the proportions between the different parts of the animal

Congee tank System—Similar to brine tank system except that a weak brine is used and part of the water in the brine is frozen The latent heat of fusion of the ice is taken up as it melts making it possible to store more refrigeration

Consignment Sales—A public auction at which cattle consigned from a number of farms to a central location are sold. The auction is generally conducted by a sales committee

"Conski"—A term sometimes used by ice cream makers meaning plain condensed skim milk containing no added sugar and not superheated

Constituents of Milk—See Milk and Cream

Constituents of Milk (Table)—See Reference Section P 28,

Constitution (In dairy cattle)—The power to retain good health under continued heavy milk production or work for a longer period of time than the average animal

Contagious Abortion—See Diseases In Cattle

Contagious Disease—A disease communicable by contact with an animal suffering from it or with some secretion of or object touched by the animal or by insect vector (disease carrying organism)

Containers for Milk—See Dairy Products, Packaging for Retail Trade

Contaminate—To permit infectious or other undesirable foreign matter to gain access to a product In a dairy sense generally means carelessness in permitting undesirable bacteria to get into or to develop in the milk, or other dairy products on utensils or dairy plant equipment

Continuous Condensing—See Milk, Processing and Processing Equipment.

Continuous Filter—See Filter Continuous

Continuous Flow Heaters, Continuous Flow Holder Continuous Flow Pasteurization—See Milk Processing and Processing Equipment

Continuance Grazing—The animals are allowed to graze more or less continually through the whole grazing season This practice is quite unsatisfactory from every standpoint.

Contour Farming—Laying out crop fields and farming them in such a manner that machinery is operated on a line across the slope parallel with the contour of the hill not up and down

Contour Furrow—In contour farming a furrow plowed with the contour of land to hold water or lead it off on a gradual slope so as to prevent washing

Contour Line—An imaginary line connecting the points of a land surface that have the same or very nearly the same elevation also the line representing this on a map or chart

Contour Plowing—Plowing land on a line parallel with the contour plowing around the hill or across a slope

Control—Any device for regulation of a machine in normal operation manual or automatic.

Convection of Heat—The diffusion of heat through a liquid or gas by the motion of its particles which is due to their being unequally heated

Conveyors—Labor-saving devices used very extensively in nearly all dairy operations They are usually in the form of roller conveyors inclined sufficiently so that finished products move or roll slowly from bottle fillers canned milk fillers ice cream fillers and churns etc. They are also used to convey milk cans from platform to holding tanks

Convolute—One part rolled e.g. as the leaves in the shoot of some grasses

Cooked Cheese—See Cheese.

Cooked Flavor—See Milk & Cream Defects Butter Defects Cheese Defects

Coolers Cheese Cooking in Cheesemaking—See Cheese

Coolers—See Milk, Processing and Processing Equipment.

Cooler (Pond type); Coolers, Unit—See Refrigeration.

Cooley Cans—Tall, narrow, cream separating cans, commonly called shot-gun cans. Previously used in the gravity method of separating cream from milk.

Cooling Coils—See Expansion Coils.

Cooling Media—See Milk, Processing and Processing Equipment.

Cooling Methods—See Refrigeration.

Cooling Tank—See Milk and Cream, Processing and Processing Equipment.

Cooling Tank, for Cheese—See Cheese.

Cooling Tower, (Forced-draft); Cooling-tower Water—See Refrigeration.

Coon Cheese—See Cheese.

Cooper System of Defrosting—A system of defrosting whereby a perforated trough containing fused calcium chloride is placed over each tier of refrigerating coils. The calcium chloride absorbs water from the air and dissolves itself slowly; the concentrated brine so formed drips over the coils and melts the ice. The drippings are collected and the calcium chloride may be recovered by evaporation.

Cooper System Refrigeration—See Gravity-brine Refrigeration.

Cooperatives, Types of—There are 5 types of cooperatives in the milk industry:—1. Producers Bargaining Cooperatives; 2. Producers Operating Cooperatives; 3. Producer-Consumer Cooperatives; 4. Consumers Cooperatives; 5. Buying Clubs.

Copper—(Cu) One of the essential trace mineral elements in milk. A soft, malleable, ductile metal having a characteristic reddish color. It is one of the metals (covered with tin) previously used extensively in the manufacture of dairy equipment. It is often a cause of metallic flavor in dairy products if the equipment is not properly coated and the copper is exposed to the milk. It is also a constituent of milk in the proportion of about 0.5 parts per million in normal milk.

Copra, Copra Meal—See Feeds and Feeding.

Copulation—Act of coupling or joining as in sexual intercourse; coitus.

Corallin—See Rosolic Acid.

Cord—A cubic measure used especially for wood cut for fuel; measured legally in the United States as a pile of wood eight feet long, four feet high and four feet wide; measured originally with a cord or line. A cord of wood is equivalent to 128 cubic feet. Also see umbilical cord.

Core Sample of Cheese—See Cheese.

Cork—This comes from the unusually thick bark of the cork oak (*Quercus Suber*) found largely in Spain and Portugal. It is made up of the dead cell walls of the wood filled with air and is therefore very light. It has exceedingly good insulating qualities and for this reason it is used to considerable extent in dairy refrigeration for lining cold storage rooms, brine tanks and tank cars and trucks.

Corky, Stiff, Dry Weight—See Cheese Defects (Cheddar Body).

Corn—A thickened, underground bulb-like storage organ from which new leaves and stems may arise. It differs from a bulb in that the fleshy portion is solid stem tissue instead of a series of thickened overlapping leaves, such as timothy.

Corn, (Indian Corn, Zea mays, Maize)—A native grass cultivated on the American continent by the Indians long before the coming of the Europeans. The common name for this plant in the United States, Canada and Australia is corn, while elsewhere it is called maize. The ripened ears and the products made from corn are widely used as food for human beings and livestock. Its six main groups of varieties according to the character of the kernels are popcorn, dent, flint, pod, soft and sweet. In England and other European countries the word corn refers to the main cereal crop such as wheat, oats, rye and barley.

Corn grows best where the nights are warm as in the central part of the U. S. known as the corn-belt, but is grown in practically all states, except the arid southwest, and also is grown in Mexico, Central & South America and to some extent in many other countries. Largely because it produces more grain and fodder than any other cereal grain, it is the most widely cultivated crop in the U. S. Corn acreage is about one-fourth the entire crop acreage and of this acreage 89% is grown for grain and the balance for forage. It surpasses all the other cereals in the production of both grain and forage. In recent years hybrid

varieties with much higher yields are taking the place of the older varieties particularly in the U S corn belt

Although the corn crop in the U S is grown mostly for its grain it is also one of the main silage crops and large acreages are grown for hogging down for hogs and for fodder The stover (what is left after husking the ears) is important as a winter feed for stock Although corn is low in protein its high starch and fat content makes it very valuable for fattening livestock

For the many uses for turn and its products see Feeds and Feeding

Corn and Cob Meal, Corn and Cowpea Silage; Corn and Oat Chop Corn and Oat Feed Corn and Soybean Silage Corn Bran, Corn Chop Corn Cob; Corn Fodder; Corn Fodder Silage Corn Germ Cake; Coco Germ Meal, Coco Gluten Feed Corn Gluten Meal, Corn Grits Corn Meal Corn Oil Cake Corn Oil Meal, Corn Silage, Corn Stover; Corn Stover Silage—See Feeds and Feeding

Corn Belt—An area in central United States where large acreages of corn are raised including such states as western Ohio Indiana Illinois Iowa and parts of Missouri Minnesota Kansas Nebraska and South Dakota

Corn Binder, Corn Comb—See Corn Harvesters

Corncribs—Well ventilated slat structures for holding or storing corn Many are now equipped with air drying flues and with electric fans and heating devices

Corn Cutter—A sickle knife or form of corn harvester for cutting down stalks of corn also a machine for cutting up stalks of corn for stock food

Corn fed—Fattened largely on corn or other grain as animals for market

Cornfield—In America a field of Indian corn or maize In Europe a field in which corn is growing specifically a field of wheat rye barley or oats

Corn Harvesters—Implements used for the harvesting of corn

1 A corn binder for harvesting the standing corn consists of the cutting attachments and a device for binding the cut corn into bundles which can either be hauled to the silo or shocked in the field to dry

2 A corn picker which picks off, husks and delivers corn into accompanying truck

3 Forage harvester which chops ears and all other parts of the plant and delivers them into accompanying truck ready to be hauled to the silo

4 Corn Combine which husks and delivers shelled corn into accompanying truck and shreds balance of plant in such manner that it is easily plowed under This device seems to be a good aid in controlling corn borers

Cornhog Ratio—A term used to indicate the number of bushels of corn required to purchase 100 lb of live hogs

Corn Husker or Picker—A person who removes husks from the ears of corn and delivers them into an accompanying wagon or husks the ears from shocks of corn

Cornhusker Cheese—See Cheese

Corn Husking Shucking—Picking or removing the husks from the ears of corn by hand or with machinery

Corn Knife—See Corn Cutter

Corn Picker—See Corn Harvesters

Corn Pith—The central portion of the stalk of corn used for making paper insulating materials and other industrial purposes

Corn Planter—A machine for placing corn kernels in the ground Generally power driven and operated

Corn Sheller—A machine that separates corn kernels from the cob

Corn Silk—The silky, filamentous styles which hang in a cluster from the apex of an ear of corn

Corn Snapper—A person or an implement that removes ears from standing corn but does not husk it

Cornstalk—The part of a corn plant that grows above the ground

Corn Sugar—See Glucose

Corn Syrup, Corn Syrup Solids—See Ice Cream

Cornish Cream—See Milk and Cream

Corolla—That part of the flower consisting of all the petals and usually enclosing the reproductive organs

Corporin—See Progesterone

Corpus Luteum—Literally, a yellow body. A structure, ($\frac{3}{4}$ "-1" in diameter in the case of the cow) which develops from the follicle following ovulation. It has an endocrine function, secreting the hormone, progesterone, which partially governs development and secretion of the uterus and is necessary for pregnancy.

If conception occurs, the corpus luteum persists throughout pregnancy, regressing at the time of parturition. If conception does not occur, the corpus luteum regresses after 17-18 days, permitting a new follicle to develop in preparation for the next estrus.

Corral—A yard where cattle are kept at night and where some breeding is done.

Corrosion—Corrosion and how to prevent it is a very important problem for those engaged in dairy plant operations. Many metals are oxidized and corroded due to the constant contact with moisture and washing powders. See Handbook, P. 185.

Corrosion Protective Substances—See Corrosion Retarder.

Corrosion Resistant—That which does not easily wear away or destroy the substance of a body.

Corrosion Retarder—Chemicals which retard the corrosion of metals by brine. Sodium bichromate used in the proportion of 100 lb. to 1,000 cubic feet of calcium chloride brine is the common retarder for that type of brine. For a sodium chloride (common salt) brine in an open system of refrigeration, 100 lb. of crystalline di-sodium phosphate ($\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$) for each 1000 cubic feet of brine is the retarder commonly used.

Corrosive Sublimate—A chemical compound (HgCl_2), a virulent poison also known as mercuric chloride or bichloride of mercury, used as a soil disinfectant at the rate of one ounce to seven and one-half gallons of water, making a one to 1,000 dilution. Also used as one of the common preservatives in composite milk samples to keep them from curdling until the Babcock test is made.

Cost of Milk Production—The sum total of the cost of all the items that enter into the production of milk on the farm, for example: feed, labor, housing, equipment, land and other miscellaneous costs. Two methods in use for finding the cost of milk production are (1) Field or Laboratory methods and (2) Formula method.

Field Method or Laboratory Method of Determining Cost of Milk Production may

be made in either of two ways. 1. A survey may be conducted by a trained interviewer who visits the farms and gets his information from the dairyman's records and estimates of items not in the records. This is an inaccurate but less costly method. 2. The direct or route method in which the trained investigator visits the farm regularly, verifies and keeps a check on data which makes up the cost records. This is a more accurate and expensive procedure because of the time investigator has to give to each farm.

Formula Method of Determining Cost of Milk Production is a method of arriving at costs of milk by assigning current values to the feed and labor required to produce a given quantity of milk or milk fat. Such data is especially valuable in establishing milk prices in times of greatly fluctuating feed and labor costs.

Cotherstone; Cotronese; Cottage Cheese; Cottage Cheese Coagulators—See Cheese.

Cottonseed Cake; Cottonseed Feed; Cottonseed Hulls; Cottonseed Hull Bran; Cottonseed Meal; Cottonseed, Whole-Pressed—See Feeds and Feeding.

Cottonseed Meal Poisoning—See Diseases in Cattle.

Cotyledon—The seedling leaves or the first leaves (usually 1 or 2) of the embryo. The cotyledons are sometimes a major internal storehouse for food in the seed.

Couch Grass—See Feeds and Feeding.

Coulomb—One ampere of electricity flowing for 1 second.

Coulommiers—See Cheese.

Coulter—A vertical blade or revolving disk attachment on a plow, projecting above and in front of the plow-share to cut the sod and soil.

Coumarin—The aldehyde of coumaric acid extracted from the Tonka bean, *Coumarouna odorata*, and forming colorless prismatic crystals. It may be made synthetically also. It has a bitter taste and a fragrant odor and is often used partly to replace vanilla extract. The extract of the bean may also be used with artificial coumarin and vanillin to form a cheap "compound" extract of vanilla.

Count—See Bacteria Count.

Counter-brand—A brand put on cattle to supersede a previous one.

Country Hide—The hide of an animal which has been removed by a farmer rancher or local butcher as contrasted with one removed in a slaughter house

Country Milk receiving Station—An establishment in the country, the principal function of which is to furnish a place where the milk from the producers can be received weighed cooled and otherwise prepared for shipment to the city market. Sometimes surplus milk is skimmed or manufactured into byproducts at these stations

Coupled—Said of animals in judging the relationship of one part to another as short-coupled or long-coupled

Cover Crop—A crop grown to shield the soil from the damaging effects of wind and water and thus to prevent erosion losses

Cow—The mature female of any species of cattle of the genus *Bos* which belongs to the family Bovidae. A ruminant animal whose milk is widely used for human consumption

Cowboy—The name commonly applied to a man who herds cattle on the plains of the western and southwestern United States and western Canada and does his work on horseback

Cow Chips—Dried cow dung sometimes used for fuel.

Cowhide—The hide of a cow. Leather made from the hide of a cow. A coarse whip made of rawhide or of braided leather

Cow, "Hard to Settle"—A cow that doesn't respond readily to insemination either due to disease poor physical condition or infections in the genital tract or other physiological abnormalities

Cows, Heat Tolerance of—See Climatic Physiology

Cow Manure—Excreta from cattle with or without the admixture of bedding or litter and of varying stages of decomposition. It is what is called cold manure because it does not ferment and create heat, as does horse manure and so may be used with greater safety on many crops.

Its analysis is about 0.4 0.2 0.1 nitrogen phosphoric acid and potash respectively

Cowpea, Cowpea Hay; Cowpea Silage—See Feeds and Feeding

Cowpen—An enclosure for confining cattle

Cowpox—See Diseases in Cattle

Cow Test Association—Former name for Herd Improvement Association. An organization made up of farmers and others for the express purpose of obtaining records of the performances of individual cows or herds. Such records enable one to cull or select the particular animals for improvement of the herd

Cow Tester—A man employed by a cow testing or herd improvement association for the purpose of weighing and testing the milk from members herds and keeping detailed records of production. The tester spends one day every month on the farm of each member

Cowry Flavor—See Milk and Cream Defects

Cream—See Milk and Cream

Cream Cheese; Cream Cheese (low acid); Cream Cheese Cooked Curd; Cream Cheese (stabilizers)—See Cheese

Cream Defects—See Milk and Cream Defects

Cream 80°—See Milk and Cream

Cream Gauge—See Creamometer

Cream Layer—The layer of cream which forms on top of the milk after standing

Cream Line—This refers to the rather pronounced break between the cream layer and milk as shown in the neck of milk bottles. The amount of cream in the layer is enhanced by increased percentages of fat in the milk, the coolness of the milk and the size of the fat globules. Overheating and agitation and lack of proper cooling tend to decrease the amount of cream. While the deep cream line used to be an important selling point, the increased use of homogenization and the use of paper containers has lessened its importance

Cream-line Milk—Fluid bottled, unhomogenized milk with visible cream line

Cream Plug—See Milk and Cream Defects

Cream Powder; Cream, (Powdered), Composition of—See Milk, Cream.

"Cream Rebodding"—Pasteurized cream cooled to 40° F., warmed to 80-81° F. in an internal tubular heater in 3-10 minutes and again cooled to 40-48° F. in an internal tubular cooler for 3-10 minutes shows an increase in viscosity and is known as "cream rebodding"

Cream Ripening—A term applied to the scientific fermentation of cream for butter-making. Ripening is accomplished by adding a starter culture to sweet cream which (preferably) has been pasteurized. This cream is then allowed to stand at a stated temperature for a definite period of time, to give the bacteria in the starter time to produce the required amount of acid in the cream.

Cream Route System—Now mostly obsolete. A system for bringing cream to a creamery. The creamery establishes routes and engages haulers to collect the cream from the farmers and deliver it to the creamery. Formerly the cream was weighed and sampled at each farm by the hauler at the time of collection. This method proved to be unsanitary and also some loss of fat resulted. To eliminate these features the cream is hauled in the farmers' cans and is weighed, sampled and graded at the creamery.

Cream Scales—Balance scales for weighing samples of cream into test bottles for the Babcock test. Cream scales are made in several sizes ranging in capacity from one to twelve bottles. They should have a sensibility reciprocal of 30 mgms. and should be set level and protected from drafts.

Cream Screw—See Milk, Processing and Processing Equipment.

Cream Separation in Milk—See Milk and Cream.

Cream Separator—See Milk, Processing and Processing Equipment.

Cream Spread, Dahlberg (Geneva)—See Cheese.

Cream Standards—See Milk and Cream.

Cream Station—An establishment to which farmers deliver their cream and from which it is sent to the central creamery. At most cream stations the cream delivered is weighed and tested before shipping.

Cream Test I, Cream Test II—See Dairy Tests.

Cream Thickening Substances—Added to the cream to give it more body and make it appear richer. Among these are viscogen, starch, gelatin and other stabilizers. See Viscogen.

Cream Volume Determination—The approximate determination of the volume of cream formed on a sample of milk under specified conditions, performed either with standardized straight-sided tubes or with regular milk bottles. When milk bottles are used, the volume of cream may be determined with a calibrated gauge or by measuring the amount of water required to occupy the same depth in the bottle as did the cream layer. Cream volume determinations are generally made at 0-10° C. (50° F.) for a time of 20-24 hours.

Creamed Cottage Cheese—See Cheese.

Creamer—See Emulsifier.

Creamery—An establishment where milk and cream are received and prepared for market or made into butter and sometimes cheese. The milk and cream may be received from nearby producers, from more distant individual producers, or from milk and cream-gathering stations.

Creamery Butter—See Butter.

Creamery Corporation—A creamery organization that is a joint stock company without cooperative features. Each stockholder is liable only to the extent of the money he has invested. The operations of this type of organization are generally on a large scale, and a large centralized creamery is usually representative of this type.

Creamery Inch System—A system for buying cream, in common use before the advent of the Babcock test, but now in discard. Farmers were paid on the basis of the inches of cream showing through a glass gauge on the side of cylindrical cans. An inch of cream was supposed to make a pound of butter, but obviously the amount of butter from an inch of cream varied according to the percentage of butterfat in the cream.

Creameryman—One who works in a creamery.

Creamery, Proprietary—Similar to Proprietary Condensery except in the product handled, i.e. butter. See Condensery, Proprietary.

Creaming—The formation of cream layers upon milk by the rising of aggregations of fat globules. Slow cooling to a temperature slightly above the melting point of the fat,

then rapid cooling to a low temperature which keeps the fat in a semi-solid state are the conditions for most rapid creaming

The clumping tendency is greatest if the milk is cooled rapidly to 36°-40° F

Creaming Ability—Ability of fat globules in the milk to rise to the surface to form the cream layer

Creaming Factor—An expression denoting the relation of volume of cream formed in milk upon standing to percentage butter fat present. For example a quart of milk has a cream volume of 8 fluid ounces and a fat content of 4%. The creaming factor in this case is $\frac{8}{4} = 2$

Also the relation between the fat content and the per cent of cream volume formed on milk. The normal relationship for raw milk is about 4.1 times the per cent of fat in the milk

Creamometer—A simple cream gauge which measures the layer of cream rising on top of the milk. Before the Babcock test for butterfat was developed this instrument was used to some extent in determining roughly the richness of milk

Creatine— $C_4H_9O_3N_3$. Methyl guanidine acetic acid. A non-protein nitrogenous substance present in milk to the extent of 25 to 35 mgms per liter

Creatine Test—See Dairy Tests

Creatinine— $C_4H_7O_3N_3$. "Dehydrated" creatine. A non-protein nitrogenous substance present in milk to the extent of about 10 mgms. per liter

Creole Crescenza Cascenza—See Cheese

Crested Wheatgrass—See Feeds and Feeding

Creuse Cheese—See Cheese

Crib—A box, bin or building in which grain may be stored, corn stored in a corn crib. The old fashioned corn crib usually was of open or slat construction.

A stall for cattle or other animals. A manger or rack for feeding animals

Crimson Clover—See Feeds and Feeding

Critical Reaction—Biological. That pH at which a biological process becomes too slow to measure or at which organisms die

Crop—Grain or fruit which is cut or gathered from a single field or orchard or grove in a single season or part of a season, the product of the field whether gathered or growing, the harvest, also the state of yielding crops

The depression behind the shoulder of a cow. To cut or clip off as ears or hair of animals.

To bite off the tops of growing plants

Crop, Cash—A crop sold directly from the farm as a source of ready cash, often merely to supplement the main source of income of the farm

Crop, Companion—A crop planted with some more permanent crop such as a small grain planted with alfalfa, clover or timothy. The rapid growth habits of the companion crop offer competition to and discourage troublesome weeds

Crop Forage—See Feeds and Feeding

Crop, Green Manure—See Green Manure

Crop Index—The number which expresses the relative yield of the crops on a special area when compared with the average yield over an entire region taken as 100

Crop, Intensive—A crop which occupies a relatively small space but requires a relatively large amount of labor and fertilizer. Intensive crops generally yield a relatively high value produce per unit area.

Crop Pasture—A field on which a crop as corn or soybeans or certain small grains is allowed to become fairly mature or to ripen before animals are turned in to graze

Cropping—The planting of a crop and the subsequent management through the harvest.

Crop Residue—The organic materials left on the land after the economically useful portions of the crop have been harvested

Crop, Root—Crops harvested for their edible enlarged root or lower stem parts, as mangels, carrots, etc.

Crop Rotation—A recurrent succession or alternation of different crops on the same land, to maintain soil fertility, etc., as clover, potatoes, wheat, potatoes, etc., re-peating

Crop, Soiling—See Soiling Crop

Cross—To interbreed animals of different races or plants of different kinds

crossbred—Said of offspring of purebred parents of different breeds but of the same species.

cross-breeding—The breeding of one distinct type or breed of animal with one of another breed; crossing, hybridizing; breeding between two varieties of the same species.

Crossing Over—In genetics, an interchanging of genes or inheritance factors between parts of homologous chromosomes, supposed to occur during synapsis (the moment of the joining of the chromosomes of maternal and paternal origin).

Cross-mate—To mate or breed from a male and females of different breeds, races, or kinds.

Cross-pollinate—To transfer pollen from the flowers of one plant or variety, or kind of plant, to those of another.

Crotch—The angle formed by the parting of two limbs; as on a tree or a body.

Crowe Test—See Dairy Tests.

Crude Fiber—The coarse, woody, least digestible part of feeds, composed chiefly of cellulose and lignin.

Crude Protein—The nitrogenous compounds found in feed, often called merely protein. The amount in a feed is found by first determining the amount of nitrogen in the feed and multiplying this by a factor, usually 6.25, which is derived from the average percentage of nitrogen in a feed.

Crumbly—See Cheese Defects (Body-Cheddar).

Crumbly Butter—See Butter.

Crustless Cheese—See Cheese.

Cryohydrate—The solid which separates when a saturated solution freezes. It contains the solvent and the solute in the same proportions as they were in the saturated solution.

Cryohydric Point—The temperature at which ice and dissolved substances in a solution separate out. From this point the temperature remains constant until freezing is complete. An important factor in the freezing of Ice Cream mixes, etc. (Eutectic point).

Cryoscope—An instrument used to determine freezing point. In dairy chemistry it is used to detect watering of milk. See

Hoistvet Cryoscope and Fiske Cryoscope in Dairy Tests.

Cryptorchidism—A defect that may be inherited by a bull calf wherein one or both of the testes are retained in the abdominal cavity. If both testes are retained, in all probability the bull will be sterile, but if one testis descends into the scrotum, normal sperm will be produced. Bulls with this defect should not be used for breeding because of the possibly inherited character.

Crystallite—See Zeolites.

Crystallization—The formation of crystals from solution, starting with an unsaturated solution. It takes place when a solution is evaporated or cooled below the saturation point, except as retarded by supersaturation. Supersaturation is prevented by the addition of seed crystals of the substance. In ice cream, interest lies in having the ice crystals that may form so small that the texture of the ice cream will be smooth. In this connection it should be kept in mind that the following factors favor small crystals:

1. Rapid crystallization; 2. Agitation; 3. Inoculation with many small crystal centers; 4. High viscosity.

Crystallization of lactose constitutes a problem in ice cream, sweetened condensed milk and in dry milk products.

Crystallization Pressure—A term used sometimes when speaking of the rate of growth of crystals in solutions.

Crystalloid—A substance which when in solution can pass through an animal membrane. It lowers the freezing point of the substance in which it is dissolved and can be crystallized. Opposite of colloid. See Crystallization.

Cubed Cottage Cheese—See Cheese.

Cud—That portion of food which is brought up into the mouth by ruminant animals from their first stomach, to be chewed a second time.

Cull—To select, choose, or pick out and discard worthless from good.

Culm—The jointed stem of grasses.

Cultivation—A mechanical stirring of the soil in place as in seed bed preparation or weed control. Cultivate—to loosen or break up the soil.

Cultivator—An implement devised to break up the surface of the soil while crops are growing, to keep the soil in a porous condition and to kill weeds. Also used in seed bed preparation.

Culture—A dairy or bacteriology term used to denote suspension or growth of living bacterial or protozoan species in or on laboratory media. See **Culture Media**. See **Culture in Cheese or Butter**.

Culture-Dry—A culture which has been frozen and dried by lyophilization (freeze drying).

Culture, Lactic Acid—The growth of lactic acid bacteria in a suitable medium such as milk. See **Butter Starters**.

Culture, Liquid—A culture made in a liquid medium. Growth of bacteria in a broth, milk, or other watery solution.

Culture Media—Any nutrient materials or preparations suitable for, and prepared for and used for the growth or cultivation of microorganisms.

Culture-Mixed Strain—A mixture of two or more bacterial strains.

Culture, Single Strain or Pure Culture—The growth of but one bacterial species in a medium.

Cultured Cream—See **Milk and Cream**.

Cultured Cream Butter—See **Butter**.

Cultured Milk Drinks—See **Cultured Buttermilk and Fermented Milk Drinks**.

Curd—1 The coagulated portion of milk consisting almost wholly of casein and other proteins with some fat, lactose, and mineral matter, mechanically or chemically incorporated. Cheese is usually made from the curd, the coagulation being accomplished by the addition of starter or rennet or both.

2. In butter the curd is generally understood to be the nitrogenous or protein substances present. However, in most cases the curd content is determined by subtracting the percentage of fat, moisture and salt from 100 and designating the difference as curd. Such a method for practical purposes considers not only the proteins but also the ash, lactose and acid in the butter as curd.

Curd, Acid—See **Cheese**.

Curd Breaker, Concentrator, Dust, Knives, Mill, Mixers, Presser, Rake, Separator, Sink, Slurry—See **Cheese**.

Curdird Appearance on Melting—See **Ice Cream Defects**.

Curdling in Cooking Milk—See **Milk and Cream Defects**.

Curdy, Rubbery—See **Cheese Body (Body Cheddar) Defects**.

Curd-o-meter—A device used in measuring the softness of curd in the Hill test. It consists of a special curd knife used to cut down through the coagulated sample of milk, and an automatic compression type of spring balance placed on top of the curd knife for indicating the grams of curd tension. Used to determine curd tension. For official test see **Curd Tension Test**.

Curd Tension—A measure of the strength of the gel formed by clotting of milk with pepsin HCl or rennet. It is affected by many factors including concentrations of casein and fat, homogenization, heat treatment, concentration of calcium, and temperature. For comparative purposes the determination must be made under carefully controlled conditions. (See **Curd Tension Test**). The curd tension of normal milks varies widely. It was formerly held that curd tension was a measure of digestibility.

Curd Tension Test, Curd Test, German, Curd Test, Swiss Rennet—See **Dairy Tests**.

Curing Cheese, Curing Rooms—See **Cheese**.

Current Cheese—See **Cheese**.

Cutin—The waxy material covering exposed surfaces of most leaves and young stems.

Cutter Grade Beef—See **Carcass Beef Specifications**.

Cutters—Hydraulic, See **Cheese**.

Cutting Fluids—Lubricating agents one function of which is to keep working parts of machines cool. Apart from its rusting action water is a suitable agent. Oils are indispensable in certain cutting operations.

Cutting Wires—See **Cheese**.

Cysteine— $\text{HS-CH}_2\text{-CH(NH}_2\text{)COOH}$. An amino acid present in certain proteins. B-lactoglobulin is the principal protein in milk that contains cysteine. Its content is about 11 gms/100 gms. The sulfhydryl groups of the cysteine residue of B-lactoglobulin are important in relation to cooked flavor and anti-oxidogenic properties in milk.

Cystine— $[S-CH_2-CH(NH_2)COOH]_2$. An amino acid present in milk protein. Casein contains only a small amount of cystine (0.3%) but the whey proteins each contain considerable amounts.

Cytology—The branch of biology which deals with the study (including microscopic study) of cells, with special regard to their

internal construction, function, mode of multiplication, chemistry and life history.

Cytoplasm—The protoplasm of cells as distinct from the nucleus.

Cytoplasm—The cytoplasmic contents of the cell, as distinguished from the nuclear contents.

D

Dadhi—See Milk, Fermented.

Dahlberg Test—See Ice Cream.

Daily Quota (D-Q) Fortified Milk (Trade Term)—A fresh, homogenized milk fortified with vitamins and minerals up to a level which, in one quart, provides the daily minimum F.D.A. (Food & Drug Administration) requirements of five vitamins and four minerals. Each quart contains:

- 4000 U.S.P. units Vitamin A
- 1 mg. Vitamin B₁
- 2 mg. Vitamin B₂
- 400 U.S.P. units Vitamin D
- 10 mg. niacin
- 1000 mg. calcium
- 800 mg. phosphorus
- 10 mg. iron
- 0.1 mg. iodine

Dairy—A place where milk is produced, as a dairy farm; or more commonly, a place where milk and milk products are processed and offered for sale. This term may be defined differently in different states according to statute.

Dairy Bacteriology Books—See Book List in Reference Section.

Dairy Breeds, Milk Characteristics of—Holstein cattle are noted for giving large quantities of milk, low in fat content, approximately 3½%; Ayrshire cattle for giving medium quantities of milk, average fat content about 4% butterfat, medium fat globules; Jersey cattle for giving very rich milk, averaging between 4¼ to 5½%, rather large fat globules; Guernsey cattle for giving the most highly colored milk making it appear very rich, fat globules and fat content about the same as in Jersey milk.

Dairy Boards—See Cheese.

Dairy Butter—See Butter.

Dairy Cattle, Water Needs—Dairy research-

ers have found that a 1000 lb. dairy cow on maintenance rations, where the animal neither gains or loses weight, will consume 4 gallons of water daily when the air temperature is 40° F., 6 gallons at 70° F. and 9 gallons at 90° F.

A lactating dairy cow weighing 1000 lb. gaining no weight but producing 35 lb. of 4% milk requires 14 gallons of water when the air temperature is 40° F., 18 gallons of water at 70° F. and 19 gallons at 90° F. daily. The size of the animal also influences the water intake; ex.—a 500 lb. animal drinks six-tenths as much as a 1000 lb. animal.

Dairy Chemistry—The science that deals with the composition of milk and other dairy products and the transformations which they undergo. There are a number of good books available, among which are *Associates of Rogers Fundamentals of Dairy Science* and *Dairy Chemistry* by Robert Jenness.

See "Chemistry and its Application to the Dairy Industry" in Handbook, P. 72.

Dairy Conformation or Type—The characteristic form of a true dairy cow. The body of the animal is angular and wedge shaped as viewed from the front, the side, or top of the withers. The bases of these wedges show evidences of capacity, as they indicate width at the hips, width of the chest, and depth of body. In general, these are indications that such an animal is more inclined to convert feed consumed into milk instead of additional flesh.

Dairy Conformation or Type of Bull—The consensus of opinion is that there is little relation between the show type of dairy bull and the milk production of his daughters. But, it is reasonable to expect that the angular, spare-type bull, lacking in beef characteristics, but having the general conformation of the angular type of a good dairy cow, will transmit that conforma-

tion to some extent to his daughters. How ever it should be recognized that since milk production is the function of a gland its relation to body conformation is limited.

It is always desirable that the animal should conform to reasonably good dairy type but his records and performance should be the deciding factors in selecting the dairy bull.

RECIPES FOR DAIRY DISHES

Although milk as a beverage is the simplest way to include its high food value in the diet there are many other ways in which milk as well as its products can be used in everyday meals.

If for any reason people do not take their daily quota a pint or more of milk as a beverage it can be included in soups, casseroles, puddings, pastries, etc.

The following recipes for dairy dishes will give you some idea of the variety of dishes in which milk and its products can help supply the daily quota of calcium and protein and necessary minerals and vitamins.

Cream Sauce

Thin	Medium
1 Tbsp butter	2 Tbsp butter
1 Tbsp flour	2 Tbsp flour
1 cup milk	1 cup milk
½ tsp salt	½ tsp salt
Thick	Very Thick
3 Tbsp butter	4 Tbsp butter
3 Tbsp flour	4 Tbsp flour
1 cup milk	1 cup milk
½ tsp salt	½ tsp salt

Melt butter slowly, stir in flour and heat until bubbly. Add milk gradually and stir quickly until smooth. Then cook, stirring constantly until mixture boils and thickens. Use either a double boiler or sauce pan.

½ cup water and ½ cup evaporated milk may be substituted for 1 cup whole milk or 1 cup water and 3 Tbsp nonfat dry milk may be substituted for 1 cup whole milk.

Cream of Celery Soup

Cook 2 cups celery with 1 slice onion and several dried celery leaves. Add to 1 recipe Thin White Sauce and season with 1 teaspoon salt.

Cream of Potato Soup

Cook 2 cups potato and add with 1 tablespoon chopped pimiento to 1 recipe Thin White Sauce. Season with salt and pepper.

Cream of Tomato Soup

- 2½ cups cooked tomatoes
- 1 tsp salt
- ¼ tsp pepper
- 2 tsp sugar
- ¼ cup chopped onion
- 1 bay leaf
- 3 Tbsp butter
- 3 Tbsp flour
- 2 cups milk

Combine tomatoes, seasonings, onion and bay leaf and simmer 10 minutes. Strain. Melt butter in saucepan over low heat. Blend in flour and heat until bubbly. Add tomato pulp and cook until sauce boils and thickens, stirring constantly. When ready to serve, stir heated tomato sauce into cold milk and heat. Serve immediately.

Danish Buttermilk Soup

- 1 qt buttermilk
- 1¼ Tbsp cornstarch
- ¼ cup blanched chopped almonds
- 1 cup seedless raisins
- Small piece stick cinnamon
- Small piece lemon rind

Cook slowly in double boiler. Sugar to taste.

Oyster Stew

- 1 pint oysters
- 5 cups milk
- ½ cup butter
- ½ tsp salt
- ¼ tsp paprika
- ½ tsp pepper

Place oysters and juice in saucepan and heat gently. Add ¼ cup of the butter and the salt and pepper. When the oyster juice begins to simmer and the edges of oysters curl, add the scalded milk. Heat to boiling, stirring occasionally. Add remaining butter and sprinkle with paprika. Remove from heat and serve at once.

Corn Chowder

- 2 oz. salt pork
- 1 small onion, sliced
- 1 #9 can corn
- 2 cups diced potatoes
- 1 can cream of celery soup
- 1 tsp salt
- 1 Tbsp sugar
- ½ tsp pepper
- 1 cup water
- 4 cups milk, hot

Fry pork golden brown, add onion and cook without browning for 5 minutes. Add water and potatoes and cook until potatoes are tender. Add celery soup, corn, sugar, salt and pepper and blend. Add hot milk and heat to boiling point, stirring occasionally. Serve with a garnish of whipped cream.

Scalloped Potatoes

- 2 Tbsp. butter
- 2 Tbsp. flour
- 1 tsp. salt
- $\frac{1}{8}$ tsp. pepper
- 2 Tbsp. grated onion
- 2 cups milk
- 4 cups sliced, raw potatoes

Melt butter in a saucepan over low heat. Blend in flour and seasonings and beat until bubbly. Add grated onion and milk and cook until sauce boils and thickens, stirring constantly. Place half of potatoes in a buttered $1\frac{1}{2}$ quart casserole. Pour half of sauce over potatoes, lifting potatoes with a fork so all are covered with sauce. Add remaining potatoes and sauce. Cover and bake in a moderate oven, 350° F., for 30 minutes; uncover and continue baking about 30 minutes until potatoes are tender and top is browned. For variation add 1 cup grated cheese to sauce or add cooked, cubed meat such as ham, roast pork or beef, corned beef or dried beef.

Cheese Souffle

- 2 Tbsp. butter
- 3 Tbsp. flour
- 1 tsp. salt
- $\frac{1}{4}$ tsp. mustard
- $\frac{1}{4}$ tsp. paprika
- 1 cup milk
- 1 cup grated American cheese
- 3 eggs

Melt butter over low heat, add flour and stir to a smooth paste. Add seasonings and milk; cook, stirring, until sauce is thick and smooth. Add cheese, stir until melted and cool. Beat egg yolks until thick and light colored and fold into cheese sauce. Fold in stiffly beaten egg whites. Pour into an ungreased casserole and bake at 325° degrees about 45 minutes or until top is firm to the touch and nicely browned. Serve immediately.

Cheese Puff

- 1 cup milk
- 1 cup soft bread crumbs
- $\frac{1}{2}$ cup grated cheese
- 2 Tbsp. butter
- $\frac{1}{2}$ tsp. salt
- $\frac{1}{4}$ tsp. pepper
- 3 egg yolks
- 3 stiffly-beaten egg whites

Scald milk in double boiler; add crumbs, cheese, butter, and seasoning. Stir in unbeaten egg yolks. Carefully fold in egg whites. Pour into greased baking dish, set in pan of hot water, and bake in moderate oven (325° degrees) until mixture will not adhere to a knife, about 30-45 minutes.

Macaroni and Cheese

- 2 cups broken macaroni
- 2 Tbsp. butter
- 1 Tbsp. flour
- $\frac{1}{4}$ tsp. dry mustard
- Dash pepper
- 2 cups milk
- 2 cups grated American cheese
- $\frac{1}{2}$ cup buttered crumbs
- 1 tsp. salt

Cook macaroni in boiling, salted water until tender; drain and pour into a buttered casserole. Meanwhile, melt butter in a saucepan over low heat. Blend in flour and heat until bubbly. Add seasonings and milk and cook, stirring constantly, until sauce boils and thickens. Remove from heat and stir in grated cheese. Pour sauce over macaroni, stirring so that all macaroni is coated with sauce. Cover with buttered crumbs and bake in a moderate oven, 350° F. for 20 minutes.

Chicken a la King

- 1 cup sliced, fresh or canned mushrooms
- 4 Tbsp. butter
- 4 Tbsp. flour
- $\frac{1}{2}$ tsp. salt
- 2 cups milk
- 2 cups diced, cooked chicken
- 1 tsp. onion juice
- $\frac{1}{8}$ tsp. pepper
- $\frac{1}{4}$ cup pimento strips
- Patty shells or toast points

Fry mushrooms in butter until lightly browned. Blend in flour and salt and heat until bubbly. Add milk and cook, stirring constantly, until sauce boils and thickens. Add chicken, onion juice, and pepper and heat thoroughly. Remove from heat, add pimento, and serve in patty shells or on buttered toast points.

Tuna and Noodles au Gratin

- 3 Tbsp. butter
- 2 Tbsp. flour
- $1\frac{1}{2}$ cups milk
- 1 tsp. salt
- $\frac{1}{4}$ tsp. pepper
- $\frac{1}{2}$ lb. American cheese, grated
- 1 4-oz. can sliced mushrooms
- 1 $7\frac{1}{2}$ -oz. can tuna
- 1 4-oz. package noodles, cooked
- $\frac{1}{2}$ tsp. paprika

Make a white sauce of butter, flour, milk and seasonings; add cheese and stir until smooth. Put mushrooms, flaked tuna and noodles in greased baking dish in order named, with part of cheese sauce over each layer. Garnish with a few button mushrooms, top with crushed potato chips, and bake in a hot oven 20 minutes or until golden brown. (400 degrees)

Shepherd's Pie

- 3 cups left-over beef or veal cut in cubes
- 2 cups left-over vegetables (onions celery carrots peas)
- 2 cups thin cream sauce
- 2 cups mashed potatoes
- Seasoning
- 1 Tbsp shortening (butter)

Mix meat and vegetables with cream sauce. Pour into greased pie dish. Cover with mashed potatoes. Bake in a moderate oven twelve minutes.

Creamy Baked Custard

- 4 or 6 eggs
- $\frac{1}{2}$ cup sugar
- $\frac{1}{2}$ tsp salt
- 1 quart milk, scalded
- 1 tsp vanilla
- Dash nutmeg

Use 4 eggs for making individual custards and 6 eggs for large custard. Beat eggs slightly, add sugar and salt and mix well. Add scalded milk gradually, stirring constantly. Flavor with vanilla and sprinkle with nutmeg if desired. Butter 6 or 8 custard cups or one $1\frac{1}{2}$ -quart baking dish and pour in custard mixture. Place in shallow pan of warm water and bake in moderate oven 350° F. 35 to 40 minutes for individual custards, or 60 to 65 minutes for large custard. A knife inserted in the center will come out clean when custards are done.

Cottage Cheese Cake

- 2 cups zwieback crumbs
- 2 Tbsp butter
- 2 Tbsp sugar
- 2 cups dry cottage cheese
- $1\frac{1}{2}$ cups cream
- 1 Tbsp flour
- 1 cup sugar
- $\frac{1}{2}$ tsp salt
- $\frac{1}{4}$ tsp nutmeg
- 3 eggs separated
- Grated rind of $\frac{1}{2}$ lemon
- $\frac{1}{2}$ tsp vanilla
- $\frac{1}{4}$ tsp lemon extract

Blend zwieback with softened butter and 2 tablespoons sugar. Press all but $\frac{1}{4}$ cup of mixture firmly against bottom and sides of a 9-inch spring form pan. Press dry cottage cheese through a sieve. Combine cheese with remaining ingredients except whites of eggs and mix well. Beat egg whites until stiff but not dry and fold into batter. Pour into crumb-lined pan and sprinkle top with remaining zwieback crumbs. Bake in moderately slow oven

325° F. for about 1 hour, or until custard is set in center and delicately browned.

Cottage Cheese Drop Cookies

- 4 Tbsp fat
- 1 cup sugar
- 1 egg
- $1\frac{1}{2}$ cups flour
- $\frac{1}{4}$ tsp soda
- 1 tsp baking powder
- $\frac{1}{4}$ tsp nutmeg
- 1 cup cottage cheese

Cream the shortening and add the sugar gradually. Add beaten egg and cottage cheese. Sift the dry ingredients together, and add to first mixture. Drop the dough by teaspoonfuls on greased baking sheet and bake in a moderate oven (375 degrees). (The flour will vary with the amount of moisture present in the cheese. Flavoring may be vanilla or lemon in place of the nutmeg.)

Cottage Cheese Pie

- 1 cup cottage cheese (pressed through a fine sieve to make a fine textured product)
- $\frac{3}{4}$ cup milk
- $\frac{1}{2}$ cup sugar
- 2 egg yolks beaten
- 1 Tbsp melted butter
- $\frac{1}{4}$ tsp vanilla or juice and rind of half a lemon
- $\frac{1}{2}$ tsp salt

Mix ingredients in the order given. Bake in one crust. Cool slightly and spread top with meringue using

- 2 egg whites beaten to hold up peaks
- 2 Tbsp sugar folded into beaten whites
- $\frac{1}{2}$ tsp vanilla or lemon

Brown in slow oven. Just before serving decorate with preserved cherry, if desired.

Plain Junket

For a plain junket heat one pint of milk lukewarm, add four tablespoons of sugar and any flavor desired, when the sugar dissolves add $\frac{1}{2}$ junket tablet dissolved in 1 tablespoon of cold water. Pour the mixture into sherbet cups and let cool gradually until firm, then chill.

Honey Butter

- A spread made from honey and butter
- $\frac{1}{2}$ cup honey
- 6 Tbsp butter

Cream honey and butter until light and fluffy. It is a good spread for hot cakes, biscuits, waffles, etc.

Rum Butter

- 1 lb. butter
- $\frac{1}{2}$ tsp. nutmeg
- 2 wine glasses Jamaica rum
- 1 lb. brown sugar (dark)
- $\frac{1}{4}$ tsp. mace and cinnamon mixed

Put butter in a bowl and let it stand to soften; add sugar and spices and blend with a wooden spoon. Slowly add the rum and beat until it is like honey. Then spread on biscuits or pancakes.

Whey Honey

- 1 cup whey

- $\frac{1}{3}$ cup sugar or $\frac{1}{2}$ cup corn syrup

Mix whey and sugar and boil the mixture until it is of the consistency of strained honey. This syrup will keep indefinitely if properly bottled, and is delicious for spreading on waffles or pancakes. Used a little thinner, it makes an excellent pudding sauce. Since it requires no thickening, it is very easy to make.

Dairy Farm Structures—See Handbook, P. 210.

Dairy Herd Improvement Association, (D.H.I.A.)—A cooperative association of dairy farmers (usually about 26) who employ a supervisor to keep records of the feed consumed, and the milk produced by, each cow in the herd. The milk is tested for butterfat. Records are kept usually for a twenty-four hour period each month. The amount of feed used, and the amount of milk and butterfat, multiplied by the number of days in the month give amount of feed for the month and production for the month. At the end of the year, a complete production record of each cow in the herd, together with the amount of feed that has been used, can be ascertained. Such a system gives a quite accurate estimate of the production of a herd of cows.

The supervisor also has other duties such as making suggestions for the improvement of the feeding and management of the herd.

These associations are operated in co-operation with the extension services of the state colleges and the U. S. Department of Agriculture. Records are sent to the Dairy Husbandry Research Branch of the U. S. Department of Agriculture where they are tabulated and in this way many bulls are proved.

Dairy House—See Milk House.

Dairy Husbandry—That branch of agriculture concerned with the production, management and marketing of dairy cattle and dairy products.

Dairy Husbandry Research Branch, U.S.D.A.—(Formerly Bureau of Dairy Industry). Consists of three divisions; Breeding, Nutrition and Dairy Herd Improvement (DHI). It is located at the United States Department of Agriculture, Washington 25, D.C. It conducts research in breeding, feeding, and management of dairy cattle. Extensive laboratories are also located at Beltsville, Maryland.

Washington Utilization Research Branch conducts research in the manufacture and use of dairy products and by-products.

DAIRY MICROBIOLOGY

Importance of Microorganisms in Dairy Industry—In cheesemaking, flavors and physical characteristics of the product are largely ascribed to the changes made in the milk constituents by various species of microorganisms acting simultaneously or sequentially. Only a few definitely known species of bacteria and molds are added to the milk or curd in the form of starters. Probably other species enter at various steps in the process of manufacture of the cheese. (Much is yet to be learned about the biological and physico-chemical factors that govern the growth of the mixed populations found in cheese).

Taste and aroma of good butter . . . is due to starter cultures which are well known mixed bacterial species cultures selected for acid and flavor-producing ability. . . .

Yogurt, sour cream and buttermilk are other examples of changes of fermented milks made by the addition of various microorganisms to concentrated milk, cream, and skim milk respectively, giving to each product its characteristic or distinctive flavor and physical appearance. Other changes in milk constituents into such products as vitamins, solvents and other food adjuncts are now done on an industrial scale.

Microbial action in sewage treatment: . . . Dairy wastes . . . which have no useful purpose can be changed from noxious wastes to stably oxidized and non-obnoxious substances before they are discharged into streams or lakes.

Undesirable microbial activity . . . those that cause deterioration in flavor and physical appearance or produce disease . . . example, souring of milk (when not wanted), discoloration, sliminess, ropiness, gassiness, putrefaction, rancidity and many other defects caused by various microorganisms

growing in dairy products diseases also may be transmitted through milk and its products. Therefore some knowledge of microorganisms classification and properties are essential in the dairy industry.

"Some Biological Properties Of Microorganisms—In order to understand why the activity of microorganisms is important, some of their biological properties must be considered. The unit employed when discussing bacterial dimensions is the *micron* (μ). This unit is equal to 0.001mm or 1/25 400 inch. Most bacteria are of the order of 1 to 5 μ in length or diameter and 0.5 to 1.0 μ in width. The general properties of bacteria such as shape, grouping, internal structure and physical and chemical properties are considered in a number of textbooks on general bacteriology.

It should be noted that bacteria are considered to be aquatic, plant like organisms for several reasons. They possess rigid, well differentiated cell walls such as are characteristic of plant cells but generally not of animal cells. Further, many bacteria are morphologically similar to the blue green algae although they lack the photosynthetic pigments of their algal counterparts. Finally, bacteria are holophytic rather than holozoic; that is, nutrients are taken into the cell only in solution rather than ingested in particulate form. This again is a plant like characteristic.

The ratio of surface area to volume is known as "specific surface." With the possible exception of viruses and rickettsiae, no other group of living organisms possesses greater surface to volume ratio than do bacteria. To illustrate this concept, let us assume that 2 microorganisms exist, both cubical in form, one being 1 μ per edge and the other 1,000 μ per edge. The dimensions of *Streptococcus lactis* and the common cheese mite would approximate these figures. The volume, surface area, and specific surface of these cubes are important factors in their metabolism. The cube with an edge of 1 μ , a surface area of 6 square μ would have a surface to volume ratio of 6. The cube with an edge of 1,000 μ would have a volume of one billion cubic μ , a surface area of six million square μ , and a surface to volume ratio of 0.006. If these figures were transferred to the organisms suggested above, the cheese mite would have a total surface area one million times greater than a single *Streptococcus lactis* cell, but the latter would have a surface to volume ratio one thousand times greater than the former. To appreciate the significance of this, visualize not one *Strep-*

tococcus lactis cell, but a number of them the volume of which is equal to the volume of a cheese mite (one billion cubic μ). There would then be one billion cells with a total surface area of six billion square μ or one thousand times the surface area of the larger organism. Bacteria, therefore, have great absorptive surface per unit volume and thus is one reason for their ability to effect rapid transformations of the substances they can utilize for energy or protoplasmic synthesis.

The cells of all plants and animals produce enzymes and catalysts, and even the simplest microorganism possesses a large variety of them. Each enzyme has a unique biochemical function; that is, it is specific. Not all types of enzymes are produced by any one microbial species, although some kinds of enzymes seem common to all microorganisms. It is the ability of one microorganism to produce an enzyme that another cannot produce which is in part, the basis upon which microorganisms are separated into species. *Streptococcus lactis* and *Escherichia coli* both contain the enzyme lactase, which enables them to hydrolyze lactose. Concerning the biological activities of all microorganisms then, the important characteristics are (a) their rapid multiplication under optimum conditions, (b) their high surface to volume ratios, and (c) their ability to transform chemically large quantities of material in a short period of time. The physico-chemical environment largely determines the nature and extent of microbial activity.

"Microorganisms, Classification Of—Microorganisms may be classified into seven large and perhaps heterogeneous groups—bacteria, molds, yeasts, viruses, rickettsiae, algae, all of the plant kingdom and protozoa of the animal kingdom. This sequence indicates the relative order of their importance to the dairy industry. The algae and protozoa generally are assumed to be of no major importance.

In order to understand clearly the relationship of microorganisms to other forms of life, it would be well to remember that bacteria, yeasts, and molds are considered to be members of the plant kingdom. Further, they are classified in the phylum *Thallophyta* whose members are defined as undifferentiated masses of tissue devoid of root, stem or leaf. The phylum *Thallophyta* is divided into the sub-phyla *Algae* and *Fungi*, and it is the latter sub-phylum which includes those classes of microorganisms of interest to the dairy microbiologist. Fungi are *Thallophyta* that are devoid of

photosynthetic pigments. Bacteria are placed in the class *Schizomycetes* (from Greek, *schizein*, split or cleave) or fission fungi. The class is divided further into orders, families, tribes, genera, and species. All other forms of life are similarly divided into these groups. It is common practice to refer only to the genus and species of an organism, viz., *Streptococcus lactis*, *Escherichia coli*. The complete classification of the former would appear as follows:

Kingdom: Plant
Phylum: *Thallophyta*
Sub phylum: *Fungi*
Class: *Schizomycetes*
Order: *Eubacteriales*
Sub-order: *Eubacteriineae*
Family: *Lactobacteriaceae*
Tribe: *Streptococceae*
Genus: *Streptococcus*
Species: *lactis*

Molds and yeasts are found in the classes *Phycomycetes*, *Ascomycetes*, and *Fungi Imperfecti*. Rickettsiae and viruses are placed in the orders *Rickettsiales* and *Virales*.

"Microorganisms of Milk and Dairy Products—are 'true' bacteria of the sub-order *Eubacteriineae*, viruses of the order *Virales*, rickettsiae of the order *Rickettsiales*, and yeasts and molds. Microorganisms classified in these groups may play a role either in the spoilage of milk, in disease outbreaks traceable to milk and its products, or in the manufacture of various dairy products. In the sub-order *Eubacteriineae* are found a large number of bacteria of economic or public health significance, and though these bacteria are physiologically diverse, they appear morphologically as rods or spherical cells in various arrangements. Motility, where present, is always by means of flagella, and some species produce endospores. Cell division is always by simple fission. Some species are chromogenic, but none encountered in dairy microbiology is photosynthetic." . . . They include the following families: *Lactobacteriaceae*, *Micrococcaceae*, *Enterobacteriaceae*, *Pseudomonadaceae*, *Bacillaceae*, *Achromobacteriaceae*, *Bacteriaceae*, *Corynebacteriaceae* and *Parvobacteriaceae*."

Bacteria

1. "*Lactobacteriaceae*—The members of the family *Lactobacteriaceae* are gram-positive, nonmotile, microaerophilic (requiring very little free oxygen) or anaerobic rods or cocci which divide like rods in one plane only. Surface growth on most media is generally poor. The nutritional requirements of this group are complex. . . . Certain plants, some seeds, dairy utensils, manure, and saliva have been found to harbor them. In the dairy industry they are in-

dispensable in the production of fermented milks, cheese, and culture-containing butter. . . . The spherical lactic acid bacteria are classified in the tribe *Streptococceae* in which two genera are well-known to dairy microbiologists: *Streptococcus* and *Leuconostoc*. The rod-shaped lactic acid bacteria are placed in the tribe *Lactobacillae* of which three genera, *Lactobacillus*, *Microbacterium*, and *Propionibacterium*, are important.

(a) *Streptococcus* — derived from the Greek words *streptos* meaning flexible, and *kokkos* meaning seed or grain—hence, a pliable length of seed, similar to a necklace. Streptococci are cocci (round cells) remaining united after cell division, and for this reason, they may form chains of cells. Generally, the streptococci are divided into "pyogenic," "viridans," "lactic," and "enterococcus" groups. The pyogenic group, of which *Streptococcus pyogenes* and *Streptococcus agalactiae* are representative, do not grow at 10° C. or 45° C. (50° F. or 113° F.) . . . Cause complete disruption of red blood cells in the area immediately surrounding the colony on a blood agar medium. They usually do not coagulate milk. . . . *Streptococcus agalactiae* has frequently been isolated from the milk and udders of animals afflicted with mastitis . . . is not known to be pathogenic for man nor does it survive pasteurization. . . . *Streptococcus pyogenes* is a strongly beta-hemolytic organism. It is pathogenic for man and is commonly the cause of septic sore throat, scarlet fever, septicemia, abscesses, and various other pathological conditions . . . may give rise to milk-borne streptococcal epidemics in man . . . is destroyed by proper pasteurization.

Viridans streptococci (*S. thermophilus* and *S. bovis*) . . . They do not grow at 10° C. (50° F.) but do grow at 45° C. (113° F.) *Streptococcus thermophilus* is not a thermophilic organism as the species name might imply . . . optimum temperature lies between 40° C. and 45° C. (104° F. and 113° F.); it does not grow at 53° C. (127.4° F.) . . . It is an important organism in the manufacture of cheese such as Swiss, made with a high cooking temperature, and in fermented milks like yogurt and skyr. *Streptococcus bovis* is regularly found in cow manure and cow saliva, and it may enter milk from these and other sources. . . . It survives pasteurization and frequently can be isolated from pasteurized milk held at room temperature. It also has been found in some lots of Brick cheese.

Lactic streptococci—Some of the most

widely known dairy bacteria are found in the lactic group *Streptococcus lactis* and *Streptococcus cremoris* grow at 10° C (50° F) but not at 45° C (113° F). *S. lactis* occurs in pairs on short chains in milk gram positive non motile asporogenous essential in the manufacture of cheese and fermented milk can be found in dairy utensils silage the cows coat and some plants produces an increase in amino acids and peptides in skimmilk cultures has an optimum temperature of 30° C (86° F) and a range of 10° C to 40° C (50° F to 104° F) does not survive 63° C (145° F) for 30 minutes and hence is a post pasteurization contaminant if found in pasteurized milk. Complete inhibition of many *S. lactis* strains in milk can be brought about by 0.1 unit of penicillin per milliliter or 0.5 µg of aureomycin per milliliter. Two to 6 ppm of quaternary ammonium compounds will inhibit *S. lactis* in broth but 600 to 1000 ppm may be necessary in milk. *S. cremoris* used in starter cultures (See *S. cremoris*).

Enterococci—Consists of *Streptococcus faecalis* *liquefaciens* *S. zymogenes* and *S. durans*. These bacteria grow at both 10° C and 45° C (50° F and 113° F). All species of this group resist 63° C (145° F) for 30 minutes. Found in intestinal tract *S. faecalis*—(See *S. faecalis*) and *S. liquefaciens*—(See *S. liquefaciens*) *S. zymogenes* has been isolated from Romano Cheese made from raw milk both this species and *S. durans* have been isolated from cow feces and udders and from soil and water.

(b) *Leucanostoc*—known earlier as *Beta coccus* gram positive aerobic or facultatively anaerobic found in green vegetables roots and in butter sour cream and milk. *L. dextranicum* produces acid in litmus milk and usually slime in sucrose containing media found in sour cream and milk. *L. citrovorum* commonly recovered only from commercial mixed cultures.

(c) *Lactobacillus*—derived from the Lat in lac meaning milk and bacillum staff or stick hence a rod-shaped organism from milk. *L. casei* *L. acidophilus* *L. plantarum* and *L. helveticus* are typical homo fermentative lactobacilli of interest to the dairy microbiologist are found in feces silage manure and milk and its products not easily killed by the acid produced by their fermentation of carbohydrate. *L. casei* is a gram positive non motile asporogenous rod shaped organism that forms short chains of cells in milk and longer chains in broth cultures is microaero-

philic and has an optimum growth temperature of 30° C (86° F) with a range of 10° C to 40° C (50° F to 104° F). A few strains may survive 63° C (145° F) for 30 minutes but none survive 60° C (140° F) for 90 minutes. *L. acidophilus* optimum growth temperature 37° C (98.6° F) and will not grow at 20° C (68° F). *L. brevis* var. *rudensis* and *L. plantarum* var. *rudensis* cause rusty spot defect in Cheddar cheese. *L. helveticus* grow at temperatures as high as 48° C (118.4° F) used in starter cultures for Swiss cheese. *L. lactis* used in Swiss cheese starter cultures.

(d) *Microbacterium*—gram positive non motile asporogenous rod shaped organisms. Since they are aerobic they grow well on the surface of media but poorly in the depths have irregular forms appear granular when stained form palisades of cells after fission produce catalase and only small amounts of acid found on dairy utensils and in dry milk cheese butter milk and cow manure but not in the udder very resistant to heat and may be the cause of high bacterial counts in pasteurized milk and milk powder. *M. lacticum* acid producers which grow best at 30° C (86° F) but will grow at 15° C to 35° C (59° to 95° F) and some strains have survived 80° to 85° C (176° to 183° F) for ten minutes. An example of the most heat resistant non spore forming bacteria *M. flavum* produces yellow pigment on solid media and has larger cells which are not arranged in palisades. They are found on dairy utensils on dry milk cheese butter milk cow manure but not in the cows udder.

(e) *Propionibacterium*—anaerobic organisms that require supplements of yeast extract and fermentable carbon compounds for optimal growth optimum temperature of 30° C (86° F) with a range of 15° C to 45° C (59° F to 113° F). They ferment the lactic in cheese to propionic and acetic acids and carbon dioxide. *P. shermanii* and *P. petersonii* are used in starter cultures for Swiss cheese but have been isolated from Cheddar cheese.

2. *Micrococcaceae*—Spherical or elliptical dividing into two or more planes and occurring singly in pairs or tetrads. Non motile non spore forming gram positive and produce catalase. Grow well from 22° C (71.6° F) and best at 30° C to 31° C (86° F to 87.6° F). Surface growth in some species shows yellow red or orange pigment.

(a) *Micrococcus*—Spherical arranged in

irregular masses, never in long chains. Sometimes found in the milk ducts of the cow's mammary glands and therefore are present in milk as it comes from the cow's udder. They are heat resistant and survive at 63° C. (145° F.) for 30 minutes. More species can survive H.T.S.T. than L.T.L.T. pasteurization. The species found in cow's udder are not resistant to high temperature. *M. luteus*; *M. varians*; *M. freudenreichii*, used to accelerate flavor in cheese made from pasteurized milk; *M. pyogenes* var. *aureus*, produces toxins which cause food poisoning and is a causative agent of mastitis; *M. pyogenes* var. *albus*, a causative agent of mastitis.

3. Enterobacteriaceae—Gram negative, non-spore forming rods with flagella when they are motile. Most important members of this family are the tribe *Escherichia* and *Aerobacter* which comprise the colon-aerogenes group found in intestines of animals. Their presence in milk indicates unclean and improper handling of milk. *Salmonella* does not ferment lactose to produce acid and gas. It is a causative organism in food poisoning.

4. Pseudomonadaceae — Straight to spiral, gram negative, principally water or soil forms.

(a) *Pseudomonas* species are gram negative, non-spore forming rods, sometimes motile with a single flagella. The following species are important in dairy manufacture: *P. fluorescens*, *P. fragi*, *P. nigricans*, *P. putrefaciens* and *P. viscosa*. They are very objectionable in milk or any of its products because they break down proteins and fats which leads to spoilage in dairy products. Caused by water or soil contamination as well as by utensils or equipment. Proper pasteurization destroys all species. At cool temperatures 32° C. (89.6° F.) or less they produce large reddish-gray, dirty brown, cream or porcelain-white colonies. *P. fragi* produces rancidity in cream and butter and a flat rancid bitter flavor and fruity odor in Cottage cheese. *P. nigricans* causes reddish-brown or black surface discoloration on butter. *P. putrefaciens* produces cheesy, putrid flavor defects in butter. The predominant biochemical characteristic is proteolysis. *P. viscosa* produces yellowish or brownish slimy film on cottage cheese, flat and putrid flavors and rotten odors.

5. Bacillaceae — Endospore-producing organisms, containing two large genera, aerobic *Bacillus* and anaerobic *Clostridium*. The

genera of Bacillaceae are rod-shaped cells with spores and when motile they possess peritrichous flagella.

(a) *Bacillus* are saprophytic soil bacteria, large, mostly gram-positive. The cells occur singly, in pairs, and in long chains (streptobacilli). Species found in milk and dairy products are *Bacillus cereus* var. *mycoides*, *Bacillus coagulans*, and *Bacillus polymyxa* (Aerobacillus). *B. cereus* var. *mycoides* has an optimum growth temperature of 30° C. (86° F.). The spores will withstand 63° C. (145.4° F.) for 30 minutes. May be the cause of thermophilic outbreaks in pasteurizing plants if held at high temperature a long time. *B. coagulans* is unusual in milk. Produces lactic, acetic and propionic acids.

(b) *Clostridium*—Anaerobic genus found mainly in soil and the intestinal tract of animals. The species include: *C. perfringens* (organisms producing large amounts of gas in milk, *C. putrefaciens*, *C. sporogenes*, *C. butyricum*; acidify and coagulate milk and produce foul odors and gas in both natural and process cheese as well as cheese spreads.

6. *Achromobacteriaceae*—The genus *Alcaligenes viscosus* are gram negative, non-motile, non-spore forming, rod shaped organisms. Optimum temperature 20° C. (68° F.). Killed by heating to 63° C. (145.4° F.) for 30 minutes. They are aerobic. Cause ropiness (long strands) in milk and cream which usually occurs at low temperature 10° to 15° C. (50° F. to 59° F.) Found in feeds, stagnant water, stable dust, dairy utensils, soil, and manure. *Alcaligenes metalogenes* form a white gelatinous film on cottage cheese curd but do not produce odor or change flavor.

Achromobacter lipolyticum attacks high fat products, producing rancidity. Soil and water organisms which may be the same as *Bacterium protolyticum*.

7. *Bacteriaceae*—A family containing genera of miscellaneous asporogenous, rod-shaped organisms. *Bact. erythrogenes* produces red pigment; has been found in red milk.

8. *Corynebacteriaceae*—A family containing the genus *Corynebacterium* which contains three important species: *C. diphtheriae* causes diphtheria in humans and is easily destroyed by pasteurization. *C. bovis* is found in milk directly from cow's udder, not pathogenic, produces rancidity in cream. *C. pyogenes* found in some cases of bovine mastitis. Slender-curved, club-shaped rods, gram positive, non motile, non-sporous, aerobic.

9 *Parvobacteriaceae*—Small asporous gram negative rod shaped nearly all pathogenic. See *Brucella*

Mycobacterium tuberculosis var *hominis* (man) and *var bovis* (bovine) of the family *Mycobacteriaceae* in the order *Actinomycetales* are rod shaped organisms which occur singly but do not form mycelium or other structures. *M. tuberculosis* is non motile non-spore and acid fast most heat resistant bacterial pathogen likely to be found in milk and its products

Viruses

Bacterial viruses—(Order *Virales*) of especial interest in the dairy industry include Bacteriophages very minute organisms which attack the cells of the bacterial host especially *S. lactis*, *S. thermophilus* and *S. cremoris* and multiply within the cell causing the cell to burst and die (lyse) thus destroying the growth properties of these organisms. They may exist in residues from lactic fermentation whey, milk, and sewage. Often source of great economic losses in cheese and butter plants

Rickettsia

Rickettsia (*Coxiella burnetii*)—Q fever organism infects cows, goats, sheep and are transmitted to humans through milk. *C. burnetii* small gram negative not contained by (passes through) bacterial filters no antigens. Careful pasteurization is necessary to destroy this virus

Yeasts

Yeasts reproduce by budding "true" yeast produce ascospores. Others called "false" yeasts. Grow well at 25° C. to 40° C. (77° F. to 104° F.) at rather high acidities (pH 3.5) not proteolytic, but fermentative or oxidative in metabolism of carbohydrates and organic acid. They are aerobic, form heavy dry films on surface of liquid media. They oxidize lactic acid to CO₂ and H₂O

(a) *Saccharomyces fragilis*—"true" yeast produces alcohol and CO₂ from lactose. It is destroyed by pasteurization. Found in fermented drinks, Kefir, Kumiss and in some Italian cheeses. *S. lactis* in gassy cheese, milk and Italian cheese. *S. chevalieri* in Italian cheese

(b) *Candida pseudotropicalis* var *lactosa*—"false" yeast found in outbreaks of "yeasty" or "gassy" cream causes high acid, excess foaming and yeasty odor. Also found in Kefir grains and ovals. *C. mycoderma* in yogurt and fermenting butter. *C. krusei* grows in association with *Strept. thermo-*

philus stimulates and maintains conditions favorable for growth of bacterial cultures in starters. *C. lipolytica* makes lipolytic enzymes in Blue cheese

Molds

Molds are complex, multicellular organisms differing greatly in most respects from bacteria and yeasts but in activities and methods of cultivation are somewhat similar to the other groups. Aerobic grow over wide ranges of pH, osmotic pressure and temperatures. Most appear as white cottony or wooly colonies generally white cream or green black or brownish because of pigmentation in their long thread like strands of protoplasm or in their enormous numbers of asexual spores. *Alternaria* short conidiophores borne in chains large size multicellular spores olive or dark brown color found on butter. *Cladosporium* deep olive green to black color of its vegetative mycelium and spores cause of surface discoloration in butter. *Aspergillus* has colorless mycelia but usually green or black spores found in cans of sweetened condensed milk in the form of "buttons". *Geotrichum* (formerly called oospora lactis and oidium lactis) oxidize lactic acid of cow's milk and other dairy products to CO₂ and H₂O and rapidly hydrolyzes the butter fat of cream. *G. candidum* grows on surface of sour cream and cheese as a firm felt like white mass. It may be responsible for production of yeasty flavors in dairy products and of some surface smears of cheese. It is destroyed by pasteurization. Its presence in pasteurized cream and butter is indicative of faulty handling methods. *Penicillium camemberti* and *P. roqueforti* are responsible for the characteristic flavors and appearance of camembert and roquefort cheese by proteolytic and lipolytic action. Color usually blue-green because of the color of the mature conidiospores. *Phytophthora* species have been found involved in ripening of Gammelost cheese. Black coloration. The last four molds are resistant to drying and are somewhat resistant to ultraviolet rays. Found in soil, stable dust, feeds, manure and in unclean utensils. Most molds do not grow rapidly in milk.

"Associative Action Among Microorganisms"—Most microorganisms are present as a mixed flora. Their action is synergistic that is, when two organisms produce a change which neither of them could carry out alone. *metabiotic* when there is cooperation among the various species resulting in a "food-chain" wherein the meta

bolic end-products of one are used as a food-stuff for the other; and *antibiotic*, when the presence of one species inhibits or represses the development of a second. . . . In the presence of organisms of different species, a certain bacterium, yeast or mold may show reactions which are very different from those shown in pure culture."

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Dairy Plant Wastes, Disposal of—The proper disposal of dairy wastes is often a very serious problem, principally because the acidity from sugars of milk, if in large quantities, interferes with chemical reactions as used in ordinary sewage disposal plants. Therefore, emphasis should be laid on eliminating, as far as possible through good plant management, the largest possible amount of dairy wastes within the plant itself. For instance, buttermilk and skimmilk have considerable value and should not be considered dairy waste and obviously not be permitted to go into the sewer because of the excessive cost of treating them in waste disposal plants. The same can be said of whey. These products have food or feed value if properly utilized.

Dairy Products and By-Products—

Milk	Whey Protein
Butter	Buttermilk
Condensed Milk	Cheese
Ice Cream	Whey Powder
Whey Cream	Whey Butter
Condensed Whey	Whey Drinks
Whey Syrup	Whey Vinegar
Cheese Spreads	Lactic Acid
Casein	Glue
Evaporated Milk	Whey Candy
Whole Milk Powder	Vitamins (as ribo- flavin)
Skim Milk Powder	Plastics

Dairy Products Packaging for Retail

Trade—Fluid milk, generally packed in glass or paper cartons from ½ pint to 2 gallon size; coffee or whipping cream in glass or paper containers; evaporated, condensed or powdered milk in cans and barrels. Cheese is covered with paraffin wax or put in hermetically sealed cans. Processed cheese is generally wrapped in aluminum foil or plasticized film and cheese spreads in plastic containers, parchment paper, paraffin cardboard, or glass containers. Butter in one pound and ¼ lb. prints is paraffin paper wrapped, or in cartons. Ice Cream is packed

in parchment paper cartons and plastic containers.

Dairy Products, Technical Control of—In well regulated plants technical control includes arrangements for line testing of all operations in the dairy plant by qualified workers, and also the liberal use of modern technique, instruments and devices for quick results.

Dairy Research—For assistance on unsolved dairy problems consult research workers and their publications in state agricultural colleges and state universities and Research Directors in U. S. Department of Agriculture as well as researchers in other leading universities and research workers in foreign countries.

Dairy Salt—A boiled salt with a high degree of purity, used especially in butter and cheesemaking.

Dairy Technology—A study of scientific information as applied to dairy processes. Many dairy schools, colleges and universities offer special courses in this and related subjects.

Dairy Temperament—The natural ability of a cow to produce milk and to use for milk production practically all of the nutrients that she can digest in addition to her maintenance requirements. Good dairy temperament is usually associated with a cow that has little surplus fat even though she has plenty to eat. A high producing cow with good dairy temperament is usually thin and clean cut over the withers, has a sharply defined backbone, and is fairly free of flesh in the hip and pelvic regions.

DAIRY TESTS

Acid Test—See Manns' Acid Test.

Acidity, Titratable, Determination of, in Cream Cheese—

10 grams of cheese.

Add hot water (104° F.) to make 105 c.c.

Shake and filter.

Titrate 25 ml. portions with 0.1N NaOH.

Express results as lactic acid.

1 ml. of 0.1 N NaOH = 0.0090 gms. acid.

Activity Test, for Starters—A test to measure the activity of lactic starter for making cheese. Also called Horral-Elliker Test.

1. Mix 10 gms. of high grade spray-dried nonfat dried milk with 90 mm. of distilled water and place in a cotton stoppered Erlenmeyer flask.

2 Sterilize at 15 lb pressure for 10 minutes

3 Measure out 10 ml of the sterile milk with a sterile pipette and place in a sterile screw top test tube

4 Adjust the temperature of the tube of contents to 99.9° F in a water bath

5 With a sterile pipette measure 0.3 ml of the starter and add it to the 10 ml of sterilized milk

6 Inoculate at 99.9° F for 3.5 hours

7 Empty the 10.3 ml of the inoculated mixture into a clean flask for titration, rinse the tube with 5 ml of distilled water and 1 ml of a 1% solution of phenolphthalein and titrate with 0.1N of sodium hydroxide to a faint pink

Interpretation of results

1 An acidity of 0.4 indicates active starter

2 An acidity of 0.3 to 0.35 indicates a slow starter

3 An acidity less than 0.3 indicates that the starter is unsatisfactory for cheese making

Alcohol Test for Stability of Milk—A test used to indicate the stability or acidity of milk which is to be subjected to high temperatures as in evaporation or sterilization. The test consists of mixing in a test tube 2 cc. each of milk and ethyl alcohol of a definite percentage (68-75% alcohol by volume) and noting whether or not coagulation occurs. White particles of coagulated casein on the inner walls of the test tube indicate an acidity of at least .21% the coarser the particles the greater the acidity.

The alcohol test is said to be more useful than an acidity determination in predicting the stability of milk destined to be evaporated and sterilized by heat. In general milks not precipitated by 70% alcohol are stable enough for this purpose.

Aldehyde Reductase Test—See Schardinger's Test

Alizarin Alcohol Test—A test for acidity depending on the color changes observed in a neutral alcoholic solution of alizarin dye (de-oxyanthraquinone) when 2 or 3 cc. are added to an equal amount of milk in a test tube and shaken. Coagulation changes may also be observed.

With fresh normal milk of 16% acidity, the color is lilac red. As acidity increases the color becomes brownish then yellowish until with milk of .36% acidity or more the color is yellow.

There is no coagulation of milk in this test until the milk is over 18% in acidity.

After this point coagulation takes place and size of the flakes increases with acidity to maximum size at an acidity of .36%. If milk has a normal acidity of 16-18% but coagulates in very large flakes the color being dark brick red it is evidence of the presence of rennet forming bacteria and the milk is considered to be of doubtful value as market milk.

If milk turns violet and coagulates in fine flakes the milk is alkaline probably from a diseased udder and is regarded as unfit for cheese making or household use.

Alkaline Detergent Solutions Test—The analyses of alkaline detergents and alkaline detergent solutions in dairy plants is usually confined to the determination of alkaline strength. Their strength may be expressed in various terms of alkalinity depending on the type of detergent and the information desired. A review of the literature indicates many terms for alkalinity are in use some of which duplicate each other. There are four determinations commonly made in routine dairy plant titrations of alkaline detergent solutions. The recommended designations for these determinations and their interpretation are:

1 *Active alkalinity*—the percentage alkalinity at the phenolphthalein endpoint (P endpoint)

2 *Inactive alkalinity*—the percentage alkalinity at the methyl orange endpoint minus the phenolphthalein endpoint (MO-PP)

3 *Caustic alkalinity*—the percentage alkalinity at the methyl orange endpoint minus two times the methyl orange endpoint minus the phenolphthalein endpoint (MO-2 (MO-PP))

4 *Total alkalinity*—the percentage alkalinity at the methyl orange endpoint (M endpoint)

When testing can washer solutions and general cleaning solutions active alkalinity is usually desired. In testing bottle washer solutions caustic alkalinity and total alkalinity are desired. The inactive alkalinity test provides information on the reserve alkalinity available.

Arnold Test—See Guaiac Test

Babcock Test for Fat in Milk*—A test for butterfat in milk and milk products invented in 1890 by Dr S M Babcock, Chief Chemist of the Wisconsin Experiment Station.

* Much of the data regarding Dairy Tests courtesy of Milk Industry Foundation.

Apparatus

1. Babcock milk test bottles, 6.5 inch, 18 gm., 8%, graduated in 0.1% divisions, and conforming with local state requirements; or 6 inches, 18 gm., 10%, graduated in 0.2% divisions and conforming with Wisconsin state requirements. (6.5 inches is the average length of the Babcock test bottle.)

2. Babcock pipette (17.6 ml.) conforming with local state requirements.

3. Babcock acid measuring device (17.5 ml. charge).

4. Babcock centrifuge, electric or steam driven (equipped with heating element if electrically driven).

5. Dividers or knife edge calipers, sharply pointed, with sufficient tension to retain test setting.

6. Tempering bath which may be maintained at 131-140° F. (55-60° C.), fitted with rack to hold bottles in fixed vertical position and with a properly attached Fahrenheit thermometer.

7. Mechanical shaker for Babcock bottles (not essential but desirable to promote uniformity of mixing of milk and acid and to facilitate speed of testing).

8. Accurate speed indicator, separate or permanently attached to the centrifuge.

9. Sulfuric acid hydrometer for use at 68° F. (20° C.)

10. Fahrenheit thermometer, accurate to 1 degree, maximum graduation 2 degrees. Graduations not more than 40 degrees per inch, and range 20 to 220 degrees.

11. Cup for mixing milk and cream samples of at least 1200 ml.

Reagents

1. Babcock sulfuric acid (H_2SO_4), sp. gr. 1.82-1.825 at 68° F. (20° C.), stored in tightly stoppered containers.

2. Clean distilled water or clean low-carbonate soft water, for addition to test bottles.

Procedure

1. Mark the test bottles plainly with pencil or other marking that will not be easily smudged or removed. Test bottles must be clean, and graduation lines must be clearly visible.

2. Temper the milk sample to 60-70° F. (15.6-21.1° C.) and mix thoroughly by pouring at least three times from one vessel to another.

3. Measure 17.6 ml. of the milk into the Babcock pipette by adjusting the top of the milk meniscus to the level of the

graduation line, and transfer the contents to the test bottle by allowing the milk to drain freely from the pipette, and then blowing the last drop from the pipette.

Note: When the practice is to drain the pipette a rubber band fastened around the pipette just below the bulb will protect the bulb and facilitate the escape of air from the test bottle. The length of the delivery tube should be sufficient to pass the lower opening of the test bottle neck. Before inserting the pipette nozzle into the bottle neck the nozzle should be wiped free of milk, care being taken not to remove any milk from the bore. Use of more than one pipette when measuring a series of samples saves time.

4. Add 17.5 ml. of Babcock H_2SO_4 at 60-70° F. (15.6-21.1° C.) by tipping the test bottle and allowing the acid to flow gently down the neck of the bottle as it is being slowly rotated.

Precaution: Babcock acid and milk should be at approximately the same temperature when mixed. If acid is added too fast, air bubbles will be entrapped in the test bottle neck; if acid is allowed to drop directly into the milk there may be a violent reaction which will project curdled milk into the bottle neck and may even cause some of the contents to spatter out. The 17.6 ml. charge will be found satisfactory when the acid is adjusted to the prescribed specific gravity, but a variation in the amount of acid may be necessary for good results should the acid be slightly stronger or weaker than prescribed.

5. Mix the acid and the milk with a gentle rotary movement of the bottle, by hand or by means of a mechanical shaker, until the milk solids other than fat are thoroughly digested. When curd particles are no longer visible and the bottle contents have assumed a dark chocolate color, the mixing may be regarded as complete.

Precaution: When mixing, the operator should hold the neck of the bottle away from himself and others, and should avoid violent shaking to prevent spattering of bottle contents which would render the test inaccurate and possibly cause injury to personnel.

6. Immediately place the test bottles in the centrifuge, taking care to balance the load and, maintaining a temperature of 135-150° F. (57.2-65.6° C.) in the centrifuge, whirl them for 5 minutes at a speed consistent with the following recommendations:

Diameter of
centrifugal head
in inches

R.P.M.

10	1074
12	930
14	909
16	818
18	800
20	759
22	721
24	693

Note The diameter of the centrifugal head is measured from the inside bottoms of opposite cups when they are extended in the horizontal whirling position. The rpm of the centrifuge with the cover closed should be checked daily with speed indicator. Obviously a centrifugal head of less than 14 inches in diameter would not accommodate the regular Babcock milk test bottle which has an average length of 6.5 inches. Based on Herrington's calculations the speeds should be 10" 1171 12" 1033 14" 934 16" 859 18" 800 20" 751 22" 711 24" 677.

After the 5 minute whirling add soft water at about 140° F (60° C) to bring the level of the bottle contents to a point just below the lower end of the bottle neck. Centrifuge again for 2 minutes and add water to bring the level near the top of the graduated portion of the neck.

Note If necessary to use hard water add two or three drops of H_2SO_4 per pint of the hot water to prevent foam from forming on top of the fat column when the water is introduced into the test bottle.

7 Centrifuge for 1 minute and then immerse the bottle in water bath at 131-140° F (55-60° C) so that the water level of the bath comes slightly above the upper meniscus of the fat column. Allow the bottles to remain until the fat columns are in equilibrium and the lower meniscus has assumed final form (at least 3 minutes—about 3 to 5 minutes).

Note Practical experience indicates that accurate results may be obtained by reading the test bottle directly from the heated centrifuge provided a minimum temperature of 140° F (60° C) is maintained in the centrifuge at all times and the centrifuge is closed after the removal of each bottle.

8 Remove the bottles one at a time wipe and with dividers or calipers read the test directly by simultaneously measuring the length of the fat column from its lowest point to the highest extremity of its upper meniscus. Duplicate tests should agree with

In 0.10%. When there is any doubt regarding the accuracy of any test the sample should be retested in duplicate.

Babcock Test for Fat in Homogenized Milk—It has long been recognized that the standard Babcock test procedure for fat in non-homogenized milk does not yield comparable results when applied to homogenized milk. General experience has indicated that somewhat lower fat tests (usually not more than 0.10% lower) may be expected on homogenized milk as compared to non-homogenized milk when the standard Babcock test is applied. In addition to this the application of the standard Babcock procedure to homogenized milk very often produces a clarified or curd-like formation immediately beneath the fat column in the neck of the test bottle. This would cast doubt on the accuracy of the reading and constitute sufficient cause for the rejection of the test in question. This situation led to the development of a number of modifications of the Babcock procedure designed to eliminate the formation of curd-like material in the neck of the Babcock test bottle and to promote closer agreement between the fat test of the same milk before and after homogenization. Lucas and Trout compared the various modifications recommended and suggested a Babcock procedure for testing homogenized milk in which they believe is embodied the best features of these modified Babcock methods.

Modified Babcock Test for Fat in Homogenized Milk, (Lucas and Trout)—

Apparatus

Same as listed for Babcock Test for Fat in Milk except

1 Sulfuric acid measuring device to permit addition of 17.5 ml charge of acid in measured portions of 8.5 and 4.5 ml respectively.

2 Mechanical shaker for Babcock test bottles.

Reagents

1 Babcock sulfuric acid (H_2SO_4) sp gr 1.83-1.835 at 68° F (20° C), stored in tightly stoppered containers.

2 Clean distilled water or clean low carbonate soft water for addition to test bottles.

Procedure

Same as for Babcock Test for Fat in Milk except

1 Temper the H_2SO_4 and the homogenized milk to 70° F (21.1° C).

2. Add the H_2SO_4 to the milk in the test bottles in three portions 8, 5, and 4.5 ml. respectively, mixing the acid and the milk by rotary motion for at least 15 seconds after each addition of the acid.

3. Place the test bottles in the mechanical shaker and shake for at least 2 minutes before centrifuging.

Babcock Test for Fat in Cream—

Apparatus

1. Babcock cream test bottles (6 inch, 9 gm., 50%), graduated to 0.5% and conforming with local state specifications.

Note: For special check work or standardizing purposes the standard 9 inch, 18 gm., 30% test bottles graduated to 0.2% will be found useful.

2. Cream pipette with large tip (9 ml. capacity is a convenient size or 17.6 ml. when the 18 gm., 30% bottle is used).

3. Cream test scales sensitive to 30 mg.

4. Two 9 gm. weights.

5. Other Babcock apparatus listed as items (3) to (10) under the Babcock Test for Fat In Milk.

Reagents

1. Babcock sulfuric acid (H_2SO_4), sp. gr. 1.82-1.825 at 68° F. (20° C.), stored in tightly stoppered containers.

2. Clean distilled water, or clean low-carbonate soft water for addition to test bottles.

3. Glymol, a colored mineral oil, to flatten the meniscus, sp. gr. 0.85 at 68° F. (20° C.).

Procedure

1. Mark the test bottle plainly with a pencil or other marking that will not easily be removed or smudged.

2. Adjust the sample to about 70° F. (21.1° C.) and mix thoroughly by pouring at least four times from one vessel to another.

Precaution: Cream in which fat has become hardened may be brought into proper condition for mixing by slowly and thoroughly warming to a temperature not exceeding 100° F. (37.8° C.). Should the fat be separated or churned, heat the cream slowly to 100° F. Mix thoroughly and immediately weigh out the test portions. In such cases check samples are imperative.

3. With the aid of the cream pipette, weigh exactly 9 gm. of the sample into the test bottle which has been balanced on the cream scale, exercising care to pre-

vent the cream from spilling on the exterior of test bottle or scale pan.

Precaution: The cream scales must be set level and protected from vibration and air currents. Weights should be kept scrupulously clean, calibrated once a week with a check weight, and these check weighings should be recorded.

4. Add 9 ml. of soft water to the weighed portion and mix thoroughly by the customary rotary motion.

5. Add slowly 17.5 ml. of Babcock H_2SO_4 , at 60-70° F. (15.6-21.1° C.) in such a manner as to wash all cream from the neck into the body of the bottle. Mix thoroughly with a gentle rotary motion or by means of the mechanical shaker until visible curd has been dissolved and the contents assume a coffee color.

Precaution: Never add acid above 70° F. (21.1° C.), and avoid violent shaking when mixing the contents, thus preventing error in the test and possible injury to the operator.

Note: If the procedure required by the state law should differ from the foregoing, the state method should be followed.

6. Place the test bottles in the centrifuge, taking care to balance the load and maintaining a centrifuge temperature of 150° F. (65.6° C.), whirl for 5 minutes at a speed consistent with the recommendations given under Babcock Test for Fat In Milk, (#6, under Procedure). Add sufficient soft water at 135-150° F. (57.2-65.6° C.) to bring the level of the contents to within one-half inch of the lower graduation mark on the neck of the test bottle. Centrifuge for an additional 2 minutes and then bring the level of the contents to a point approaching the top of the graduated column. Centrifuge for 1 minute so that the fat columns are below the surface of the tempering water. Allow 3 to 5 minutes for the fat column to attain equilibrium and for the lower meniscus to assume final form, and then carefully add glymol by allowing a few drops to run down the neck of the bottle from a pipette or dropper and to flow gently over the top of the fat column.

7. Read the test directly by measuring, with sharply pointed dividers or knife-edge calipers, the length of the fat column from the lowest extremity to the point of junction with the glymol.

Note: It is preferable to employ a tempering bath for reading cream tests. However, if the number of tests to be read does not exceed four, satisfactory results may be obtained by reading the bottles directly from the heated centrifuge.

Duplicate tests should agree within 0.5%

when the 6 inch 9 gm 20% test bottle is used

Babcock Test for Fat in Ice Cream—There are a number of modified Babcock Tests for fat in ice cream most of which are quite satisfactory. However since these tests are somewhat similar only the Pennsylvania Test will be described.

Preparation of Sample Melt the ice cream at room temperature and if necessary heat to eliminate the foam. Warm ice cream mix to approximately 70° F. Reduce large particles in fruit and nut ice cream to a finely divided state.

Apparatus and Reagents Regular Babcock equipment and glassware including ice cream test bottles. Ammonium hydroxide (28-29% NH₃). Correct strength is important. Normal butyl alcohol (R.P. 117° C.). Diluted commercial sulfuric acid (approximate specific gravity 1.72-1.74 at 68° F). The acid is prepared by adding 3½ parts by volume of commercial sulfuric acid (specific gravity 1.82-1.83) to one part of water in a heat resisting container.

Procedure Weigh 9 grams of the representative sample into a 9 gram 20% ice cream test bottle care being taken to keep the fruit or nut ice cream thoroughly mixed. Add 2 ml ammonium hydroxide (preferably from a burette). Mix for approximately one half minute. Add 3 ml of butyl alcohol. Mix for approximately one minute (samples containing chocolate require additional mixing). Add 17.5 ml of the diluted sulfuric acid. Mix thoroughly until digestion is completed. Centrifuge the bottles for 5 minutes. Add water (130-140° F) to bring the contents to within one fourth inch of the base of the neck of the bottle. Centrifuge for 2 minutes. Add enough water (130-140° F) to keep the fat within the graduated portion of the neck of the bottle until read. Centrifuge 1 minute.

Place the bottles in a water bath at 130° F for 5 minutes. Allow a few drops of glycol to run down the inside of the neck of the bottle just before reading. Measure the length of the fat column from the bottom of the lower meniscus to the sharp line of demarcation between the glycol and the fat.

Precaution The small amount of sample which adheres to the inside of the neck of the bottle should be washed into the bottle by the reagent otherwise it may collect at the base of the fat column and make the correct reading of the fat column difficult.

Tests for Fat in Skim Milk or Butter milk—The regular Babcock test for skim milk and buttermilk does not yield the total amount of milk fat in the product because under the conditions of the test it is impossible to centrifuge out all of the fat. The Babcock test for skim milk will customarily read from 0.07-0.10% low and in the case of buttermilk the reading may be 0.30% or more too low. This situation led to the development of a test by the American Association of Creamery Butter Manufacturers which is reported to show very close agreement with the Roese-Gottlieb method for analysis of milk fat in skim milk and buttermilk. This test is known as the American Association test. Description of both tests follow but of the two the American Association test is preferable for milk fat determinations on skim milk and buttermilk.

A. Babcock Test for Skim Milk and Butter milk—

Apparatus

The usual Babcock equipment for milk with double necked 18 gm skim milk test bottles graduated in 0.01% divisions per milking readings up to 0.25 or 0.50% and conforming with local state specifications.

Reagents

1 Babcock sulfuric acid (H₂SO₄) sp gr 1.82-1.83 at 68° F (20° C) stored in tightly stoppered containers.

2 Clean distilled water or clean low carbonate soft water for addition to test bottles.

Procedure

1 Mark the bottles plainly with a pencil or other marking that will not be easily removed or smudged.

2 Adjust the sample to a temperature of 60-70° F (15.6 to 21.1° C.) and mix thoroughly by pouring several times from one vessel to another.

3 Draw 17.6 ml of the skim milk into the Babcock pipette by adjusting the top of the skim milk meniscus to the level of the graduation and transfer it to the skim milk test bottle through the large neck slanting the bottle in a position to facilitate the escape of air thus preventing any tendency for the large neck to clog or overflow. Flow the last drop from the pipette.

4 Carefully add in approximately three equal portions 18 to 20 ml of Babcock H₂SO₄ at 60-70° F (15.6-21.1° C.) thoroughly mixing each portion with the skim milk.

Precaution: Exercise extreme care to prevent particles of coagulated casein from entering the small or graduated neck, as pressure may be built up that would cause some of the contents to be ejected through the large neck.

5. Balance the test bottles in the centrifuge, taking care to place the large neck toward the center of the machine, to cause the fat to be forced into the calibrated neck as a result of centrifuging. Maintain a temperature of 135-150° F. (57.2-63.6° C.) in the centrifuge and whirl the test bottles for 10 minutes at a speed consistent with the recommendations given under Babcock Test for Fat in Milk, (#6 under Procedure).

After the 10-minute whirling, add clean soft water through the large neck at not less than 150° F. (65.6° C.) to bring the level of the contents to the lower end of the bottle neck, and whirl for an additional 2 minutes. Carefully add sufficient hot water to bring the fat up into the graduated portion of the small neck, and whirl again for 1 minute.

6. The test bottles may be read directly from the heated centrifuge or after tempering in a water bath at 131-140° F. (55-60° C.) for 3-5 minutes. With the aid of a pair of sharply pointed dividers read the fat column from its lower extremity to the top of its upper meniscus.

Note: Should no fat column appear in the graduated neck, the indications are that insufficient acid was added, or the centrifuge was not up to speed, or that proper temperature was not maintained during the test.

B. American Association Test for Fat in Skim Milk and Buttermilk—

Apparatus

1. The usual Babcock equipment for skim milk, with 18 gm. skim milk test bottle, the graduated neck reading up to 0.50%.
2. Graduated cylinder, 10 ml.

Reagents

1. Babcock sulfuric acid (H_2SO_4), sp. gr. 1.82-1.825 at 68° F. (20° C.).
2. Normal butyl alcohol.
3. Clean distilled water or clean, low-carbonate soft water for addition to test bottles.

Procedure

1. Measure 2 ml. of normal butyl alcohol into the 18 gm. skim milk test bottle. Add 9 ml. of skim milk or buttermilk and

7 to 9 ml. of Babcock H_2SO_4 . It may be necessary to vary the amount of acid in order to obtain a fat column of golden yellow to light amber color.

2. Mix the contents of the bottle thoroughly and centrifuge for 6 minutes at the proper speed and temperature.

3. Add sufficient clean, soft water (140° F. or 60° C.) to bring the contents to the base of the neck and whirl for 2 minutes.

4. Add enough of the hot water to bring the fat column up into the graduated portion of the small neck of the bottle, and whirl again for 2 minutes.

5. Read directly from heated centrifuge or after tempering in water bath. Double the reading to obtain the percentage of butterfat, since 9 ml. of sample was used in an 18-gm. test bottle.

Notes: (a) The fat column obtained in this test may contain small amounts of lecithin and other substances soluble in normal butyl alcohol. Check tests indicate, however, that results by the use of this method correspond more closely to the Rose-Gottlieb analysis for milk fat than do those obtained by the Babcock method on skim milk or buttermilk.

(b) Should there be any difficulty in cleaning the test bottles, introduce a small amount of lukewarm water, then carefully add a little H_2SO_4 , rinse well with this mixture, and then rinse out the bottle with clean, hot water.

Baudouin Test—A color reaction from the addition of cane sugar and hydrochloric acid to a fat. The test is used to detect sesame oil. When sesame oil cakes are fed, they produce a soft butter and often impart to milk fat the property of giving a Baudouin oil test.

Bloom Test for Gel Strength Determination—A test for grading gelatin on the basis of the gel strength of carefully prepared gelatin solutions. The Bloom Gelometer is used and the gel strength is measured by the resistance to deformation against a cylindrical plunger on the gelometer.

Apparatus

1. Bloom gelometer. This instrument may be purchased from the Glue and Gelatin Makers Association, New York. Complete instructions are furnished with the machine.
2. Water bath, properly controlled for dissolving the gelatin.

3 Refrigerator equipped with a very sensitive thermostat and containing a low temperature water bath

4 Wide mouth bottle 59 mm inside diameter 66 mm outside diameter 83 mm high to take No 9 stopper 150 ml capacity

Procedure

1 Weigh 715 gm of the gelatin and transfer to a 150 ml wide-mouth bottle. Add 100 ml of distilled water at 20° C (68° F) and stir thoroughly to prevent clumping of the gelatin. Allow the gelatin to soak until the water is absorbed (For ground gelatin not more than ten minutes is necessary but for gelatin in the form of flakes or sheets considerably longer periods often approaching ten or more hours are required)

2 Transfer to a hot water bath and dissolve at 70° C (158° F)

3 When solution is complete the foam is removed from the surface of the gelatin with a spoon and the bottle is tightly closed with a rubber stopper

4 Place the bottle in a refrigerator containing a water bath regulated at 10° C (50° F) \pm 0.1° C (0.2° F) and allow to stand for 16 hours at the end of which time the sample is ready for testing. To guard against error due to minor variations in procedure temperature or in the setting of the instrument a set of standardized samples should be run together with the unknown sample and adjustment made in accordance with the deviation of the known samples from their known values

Boiling Test—In many European countries it is thought that if milk will not boil without clotting it is unfit for use

Brine Tests for Milk—Since brine is now universally used for cooling milk and since coolers often develop small leaks in the plates or elbow connections it seems desirable to have a quick test for brine that may have accidentally entered the milk. It can be detected by the milk's higher calcium content, by its clotting on boiling and by its abnormal taste. Quantities of brine in milk may be mistaken for sweet curdling of milk.

Brom Cresol Color Test—A test for the acidity of whey. To 3 cc. of whey add 1 drop of 1:20,000 brom cresol solution. A purple or blue-purple color indicates less than 18% acid; a gray color indicates the beginning of the formation of acid and a yellow color indicates over 18% acid.

Burke Test, (Gelatin)—A test for measuring the gel strength of gelatins by means of a falling plunger, the strength being indicated by the depth of penetration. This test has been largely supplanted by the Bloom Test

Burri Method—A method for estimating the number of bacteria in milk. It consists essentially in using a loop for measuring the milk and smearing the contents of the loop on dry agar slants. After incubation at the temperature desired the colonies on the slants are counted. Inasmuch as 0.001 cc. of milk is used as the original inoculum the number of colonies found on the slant is multiplied by 1,000 to give the total count per cc. of milk being examined

Butter Test, (Modified Babcock)—A sample of butter is placed in a milk bottle stirred and melted in a hot water bath until creamy. With a piece of glass tubing 4.5 grams of this melted butter is transferred to a 9-gram cream test bottle. To this is added 10 cc of hot water and 4 cc. of sulfuric acid and the test is completed as for cream. The reading is then multiplied by two to give the percentage of fat

Butter and Cheese—Moisture, Fat and Salt Determination in—The following procedure is a rapid and fairly dependable method for determining moisture, fat and salt in butter and cheese. Operators will find this test practical for control work in the plant. With careful manipulation the test is sufficiently accurate for factory control work. Where greatest accuracy is desired as in legal cases check with Official Methods in latest issue of A.O.A.C. bulletin

Modified Kohman Method, Butter—

Apparatus

1 Electric hot plate with three heat switch

2 Special moisture and fat scale. A special scale designed for this test, can be bought from the Torsion Balance Co #173; or the ordinary torsion balance #170; can be used.

3 Aluminum beaker 125 ml capacity

4 Crucible tongs

5 Spatulas each with 4 inch blade of stainless steel

6 Sample jars of non absorbent material preferably with straight sides and tight fitting non absorbent closures such as aluminum screw caps with Vinitite liners

7. Weights. One 10 gm. weight for use with the #1735 special scale, or a 10 gm., 9 gm. or 1 gm. weight for use with the #1705 torsion balance.

8. Roll of tissue for wiping triers and spatulas.

9. Glass stirring rods, rubber tipped.

10. Several white cups.

11. Water bath.

12. Measuring flask, 250 ml.

13. Burette with stand, 50 ml.

14. Pipette, 25 ml.

Note: Mojonnier tester and apparatus can be adapted to moisture, fat, and salt test herein outlined.

Reagents

1. Petroleum ether. Distillation between 95 and 176° F. (35-80° C.). Sp.gr. 0.634-0.660 at 77° F. (25° C.).

2. Distilled water.

3. Silver nitrate (AgNO_3) standard solution. Dissolve 29.0512 gm. of pure silver nitrate in 1 liter of distilled water.

4. Potassium chromate indicator solution. Dissolve 5 gm. of potassium chromate in 100 ml. of distilled water. To be certain of the elimination of chlorides, add a few drops of silver nitrate until a brick red precipitate is formed, and filter before using the indicator.

Procedure for Moisture

1. Obtain an accurate sample by taking plugs from various parts of the churn or package. Place these in a glass bottle of suitable size. Place the sample bottle in a water bath with water 90-95° F. (32.5-35° C.). During this operation the butter should be constantly stirred with the handle of a teaspoon or with a spatula until the butter softens into a uniform mass resembling thick or whipped cream.

Precaution: Do not allow the butter to melt or oil off during this operation. This will not occur if the water in the water bath is not over 110° F. (43.3° C.) and if the sample is stirred constantly.

2. Place a thoroughly cleansed, dried, and cooled aluminum cup on the right hand pan of the moisture scale.

3. Properly tare the moisture scale by having the percentage riders on the two front scale beams set at zero, and balancing the scales with the empty cup on the right pan by using the two riders on the two rear beams.

Precaution: After balancing the scale, do not change the position of the riders. The scale must be tared with each determination.

4. Weigh out exactly 10 gm. of the sample prepared as described into a tared, cold aluminum beaker or cup.

Precaution: Speed and accuracy are essential in weighing. The cup when weighed must be at room temperature, as temperature affects the weight.

5. Heat the weighed sample slowly over the electric hot plate, rotating the aluminum beaker constantly in a circular motion by means of the tongs to prevent spattering.

Precaution: Do not allow the cup to rest directly on the hot plate or over flame without being rotated. When no electric hot plate is available an alcohol or gas flame may be used, but in such cases a wire gauze or asbestos mat should be used to prevent too rapid heating or overheating.

6. When the heating of the sample is complete, the foaming will have ceased and the curd in the bottom of the aluminum beaker will have a characteristic slightly brown coffee color. A whitish, yellowish color indicates insufficient heating and is cause of too low tests. A dark brown or black curd indicates overheating and will result in too high tests.

7. Allow the pan to cool in the air. For quick cooling place on a smooth and clean stone or iron surface. When cooled, replace the cup on the right hand pan of the scales.

8. Using the percentage rider on the lower front scale beam, again balance the scales and read the percentage of moisture direct.

Note: If moisture content only is desired, the test is completed with (8). For milk fat and salt content, continue according to the next descriptions.

Procedure for Fat

1. Remove the beaker with the dried butter without disturbing the adjusted moisture counter balances.

2. Mix the dried butter sample with 100 ml. of petroleum ether by stirring thoroughly with a glass rod. Remove the glass rod and leave the beaker with the contents undisturbed for three or four minutes, and decant the ether-dissolved fat.

Precaution: The decanting of the ether should be done with extreme care to avoid pouring off any of the residue.

3 Repeat the extraction using 50 ml of petroleum ether

4 Warm the aluminum beaker very slowly by holding it above the hot plate (Do not allow the beaker to touch the hot plate as quick heating will cause the curd to pop out of the beaker)

5 Heat until residue is dry free from solvent odor and powdery in appearance

6 The beaker is then cooled dried as before and replaced on the scale and balanced milk fat counter balances being used

7 Read the percentage of milk fat directly from the calibrated milk fat beams the counter balances of which were adjusted to balance the loss in weight of fat extracted by the petroleum ether

Procedure for Salt

1 The beaker is then rinsed three or four times with hot distilled water into a 250 ml measuring flask. Such rinsings are made up to volume with distilled water and mixed thoroughly by inverting flask several times

2 Pipette 25 ml of the water extract into a beaker or white porcelain cup. Add 2 or 3 drops of potassium chromate indicator and titrate with the standard silver nitrate solution to a permanent brownish red color. Each cubic centimeter of silver nitrate solution used is equivalent to 1% of salt in the sample. Thus if it required 3.5 ml of the silver nitrate solution the sample contained 3.5% of salt.

Note: A more definite end point will be observed if dichlorofluorescein indicator is used in place of potassium chromate. From 2 to 3 drops of a 0.1% solution of dichlorofluorescein is recommended. The change of color is from opalescent green to pink. (A 0.1% solution may be prepared by dissolving 0.1 gm of dichlorofluorescein in 100 ml of 95% alcohol and diluting to 100 ml with distilled water.)

Calculations

The percentage of curd is determined by subtracting the sum of moisture, fat, and salt (in case of salt butter) percentages determined as has been outlined from 100

Example: Total sample	=	100%
Moisture	—	16.47
Fat	—	80.50
Salt	—	2.41
Total	—	99.38%
Curd	—	0.62%

Cheese, Moisture Test—

Apparatus

- 1 Mojonnier solids dish and cover or similar type dish
- 2 Drying oven
- 3 Desiccator

Procedure

- 1 Dry and weigh or tare accurately a small dish and cover
- 2 Place exactly 10 gm of a well ground composite sample in the dish and put on the cover
- 3 Put dish and cover in a 212° F (100° C.) drying oven for 24 hours (cover prevents loss of sample should spattering occur)
- 4 Place dish in a desiccator and when cool weigh accurately
- 5 Loss in weight times 10 equals the percentage of moisture

Modified Mojonnier Method for Moisture—

Apparatus

- 1 Electric hot plate with temperature regulator or plate on Mojonnier fat slide
- 2 Total solids dish with cover bottom must be perfectly flat
- 3 Glass rod diameter 4 mm or less
- 4 Pipette with fine orifice 1 ml
- 5 Thermometer well with mercury
- 6 Mason jar pint size
- 7 Laboratory homogenizer

Sampling

Mix the cheese thoroughly in the carton or glass by stirring and turning the cheese over from the bottom of the container. The sample is then run through a laboratory homogenizer into the Mason jar thoroughly mixed and then sealed. The sample should be tested promptly to avoid any loss from evaporation.

Procedure

- 1 Weigh into a previously dried and cooled solids dish approximately 2 gm of cheese
- 2 Add 1 ml of hot 149° F (65° C.) distilled water and spread the cheese over the bottom of the dish with the small glass rod
- 3 By means of the 1 ml pipette add 1 ml of hot water wash off any particles of cheese from the glass rod into the dish using the tip of the pipette to scrape the glass rod if necessary

Note: Excessive water will cause spattering in the drying process.

4. Place dish and sample on hot plate previously regulated to a temperature of 279° F. (135° C.). Continue heating until the cheese turns to a light tobacco brown color. This usually takes from 12 to 15 minutes.

5. Cool in desiccator for 10 minutes and weigh. Express results in terms of per cent of total weight.

Salt Test

Apparatus

Erlenmeyer flask, 300 ml.

Reagents

1. Silver nitrate (AgNO_3), 0.1711 N.
2. Nitric acid (HNO_3) c.p.
3. Potassium permanganate, saturated solution.
4. Ferric ammonium sulfate.
5. Potassium or ammonium sulfocyanate, 0.1711 N.

Procedure

1. Weigh approximately 3 gm. of a well ground sample in Erlenmeyer flask.
2. Add an excess of AgNO_3 (about 18 ml.).
3. Add 15 ml. of HNO_3 and 50 ml. of distilled water and bring to boiling.
4. While boiling add 15 ml. of saturated potassium permanganate in 5 ml. portions.
5. Boil until cheese is digested.
6. Dilute to 100 ml. with distilled water and let stand until all solid matter settles.
7. Decant clear solution, wash precipitate with 100 ml. of distilled water, and again decant.
8. Combine the two portions of decanted liquid and add 3 ml. of saturated ferric ammonium sulfate (as an indicator).
9. Titrate excess AgNO_3 with potassium or ammonium sulfocyanate until a reddish color appears, indicating the end-point.
10. Calculate per cent of salt, using the formula:

$$\frac{\text{Ml. of } \text{AgNO}_3 - \text{Ml. of sulfocyanate}}{\text{Weight of sample}} = \% \text{ Salt}$$

Buttermilk Fat Test—Same as the test for skin milk.

Butyl Alcohol Test—A modified Babcock test using normal butyl alcohol and sulfuric acid for the determination of fat in buttermilk, skin milk and whey. Also known as the American Association Test.

Butyric Acid Bacteria, Test for—Approximately 10 ml. of milk is placed in each of three test tubes. These samples are heated for 20 minutes at about 167° F. (75° C.) for two days. If butyric acid is present the samples will have a noted pinkish color at the surface and there will also be a characteristic smell of butyric acid. The test is not very sensitive but if two of the three tubes show no characteristic color or smell, it may be concluded that the milk is fairly free from bacteria producing excessive amounts of butyric acid. The test is simple, requiring no pipettes or media.

Calibration of Glassware—The checking for accuracy of the graduations or scale on the glassware used in the Babcock test for milk fat. This checking or examining is usually done by a disinterested state agency, and in most states it is required by law.

Cellular Test for Pasteurized Milk—See Frost's Cellular Test.

Cheese Test, (Modified Babcock)—The sample to be tested should be finely cut and mixed. Then 9 grams of it are weighed into an 18-gram 80 or 50% cream test bottle or Paley bottle, and 12 cc. of hot water and 8 cc. of sulfuric acid are added. The bottle is shaken until the cheese disintegrates, then 17.5 cc. of acid is added and the test completed as for cream, and the reading is multiplied by 2.

For Cheddar and other hard cheeses a narrow wedge cut from edge to center most nearly represents average composition of the cheese to be tested.

For soft cheese—Neufchatel and Cream, several plugs are taken with a cheese trier and are blended well to make the sample which is then tested in the same manner as the Cheddar cheese.

Churn Test—An old method employed for determining the amount of butterfat in a sample of cream. A definite small amount of cream was churned and the amount of butter weighed.

Coagulation Test, Rolling Bottle—A test to determine the coagulation time of milk with rennet or other enzymes. 150 cc. of milk is placed in bottles, tempered to 37° C. (98.6° F.) and 1 ml. of 1/50 rennet extract is added to the milk. The bottles are rotated mechanically in a sloping position in the water bath. Appearance of curd flakes on the wall of the bottle indicate coagulation and the time is measured in revolutions.

Colon Test—A test sometimes used as an index of efficiency of pasteurization. It is based on the fact that the colon bacilli will presumably be killed at a temperature of 145° F for 30 minutes.

Creatine Test—A test for depth of flavor in starter buttermilk butter etc. It is dependent upon the development and depth of the red color when concentrated NaOH is added to a small amount of sample containing creatine. The deeper the color the more flavor there is.

Crowe Test—A modification of the Babcock test designed to determine the percentage of fat in ice cream. Two reagents are used, one consisting of butyl alcohol and ammonia and the other of sulfuric acid and ethyl alcohol. L. K. Crowe, author of the test, claims that results will average within 1/2% of Mojonnier results.

Curd Tension Test—A test for determining the strength of gel produced by clotting the casein of milk with pepsin or rennin. The American Dairy Science Association has established a standard method in which the milk is clotted with a pepsin-HCl coagulant at 35° C (95° F) and the strength of the curd measured after 10 minutes with a special automatically driven knife.

Curd Test, German (Swiss Rennet Curd Test)—This test measures the suitability of milk for making cheese. 1. 20 ml of milk placed in a sterile test tube. 2. 3-4 drops of rennet extract is added. 3. Stirred thoroughly and held at 99° F for 12-16 hours. 4. Curd is removed and examined. Desirable curd should be free from gas holes. Undesirable curd is gassy and spongy and exhibits a good deal of shrinkage.

Doane-Buckley Test—A method to determine the number of body cells in milk. It consists of concentrating the cells in milk by centrifuging and then counting the number in a definite volume of the concentrate by means of a blood cell counting apparatus.

Dried Milk Test—American Dry Milk Institute Method. See milk test as described by American Dry Milk Institute Inc. 221 North LaSalle St. Chicago 1 Illinois.

Evaporated Milk Test, (Modified Babcock)—For approximate rapid test 9 grams of milk are weighed into a milk test bottle. 10 cc of warm water and 17.5 cc. of sulfuric acid are added. The test is run as for milk and the reading is multiplied by 2.

Extraneous Matter in Cheese, (test)—For eign matter in cheese used to detect unsanitary conditions of milk production and cheese manufacture.

- 1 Weigh 8 ounces of shredded cheese
- 2 Add 8.0 ml of 10% filtered sodium citrate solution at 113° F to cheese
- 3 Mix in a Waring Blendor until homogeneous
- 4 Rinse the Blendor with 250 and 100 ml portions of the sodium citrate solution
- 5 Place in water bath at 150-160° F until cheese is completely dissolved
- 6 Pour cheese into sediment tester
- 7 Draw cheese through sediment tester by vacuum
- 8 Remove filter disc and dry at a low temperature protected from dust.
- 9 Classify the disc as 1 2 3 or 4. Good Fair Poor or Illegal respectively as classified by the State of Illinois Division of Foods and Dairies.

Falling Ball Method—A method for determining viscosity of dairy products by measurement of the time required for a standard sphere to fall a given distance into the product.

Farrington Acid Test—A practical test for measuring the amount of acid in milk. Pink tablets known as Farrington alkaline tablets are dissolved in soft water at the rate of 5 tablets to 97 cc of water. This solution is then slowly titrated against 17.6 cc of milk until the milk takes on a faint pink color. The number of cc. of solution used is equal to the percentage of acid in the sample expressed in hundredths of one per cent.

For practical use on the farm and perhaps for approximate estimation but not as accurate as Mann's acid test which is much preferred.

Fat Determination in Cheese, Babcock—

- 1 Weigh 9 gms of cheese in a cream test bottle
- 2 Add 10 ml of water at 130° F or higher
- 3 Add 17.5 ml of sulfuric acid in 2 or 3 portions to the cheese and water
- 4 Shake until all cheese is dissolved
- 5 Centrifuge 5 2 and 1 minutes
- 6 Add glycerol and read as for the cream test

Fermentation Test—A test usually run in conjunction with the methylene blue reduction method or reductase test. Milk is held in test tubes at 37° C (98.6° F) until it coagulates so that the type of fermentation can be determined, furnishing an insight in

to the types of bacteria present. The results of the fermentation and reductase tests mean more when used together because the former indicates the type of bacteria and the latter the number. Detailed directions for the fermentation test are as follows:

A sample of milk is taken in a clean glass tube, placed in a warm box and kept at about 100° F. for 20 to 24 hours. At the end of 20 hours the tubes are inspected and classed as (1) no gas or only a trace, (2) moderately gassy, (3) very gassy. Gassy milk will have off flavors and is not desirable for market milk or for cheesemaking.

Fermentation Test, (cheese)—The milk used for the Methylene Blue test is held at 100° F. until the following day. At the end of that time the milk should be gelatinous and free from gas holes to be desirable for cheese making.

Filter Pad Butter Test—A method for the detection of filth in the form of dirt, insects, and other extraneous materials in butter.

To 100 gms. of butter in a 400 cc. beaker is added 120-200 cc. of a solution of 40 gms. borax in a 1 liter of water. The mixture is boiled and filtered through a 7 cm. Buchner suction funnel equipped with rapid flow filter paper. The paper is washed with gasoline to remove any remaining grease, and then with hot water. Very moldy butter may require as many as 10 separate filter papers.

In this test the borax solution changes the curd into a soluble caseinate which passes readily through the filter paper. Mold, insects, and other extraneous material remain on the filter paper and may be removed with a needle, then placed in a drop of glycerine on a slide for examination under the microscope.

Fiske Cryoscope—A new quick and sensitive instrument for water-in-milk testing. Developed by Advanced Instruments, Inc., Needham 92, Massachusetts.

Foam Test—Used for detection of renovated butter or oleo. Also known as the "boiling" or "spoon" test. This test detects pure butter from renovated butter and oleo-margarine. A small lump of the sample is heated in a spoon over a low Bunsen flame and stirred during the heating. Pure butter, under these conditions, will boil quietly, but with the production of considerable froth or foam, which will often swell up over the sides of the spoon when, just after boiling, the latter is raised from the flame. Renovated butter or oleomargarine, under this

treatment, will crackle and sputter noisily like hot grease containing water, but will not foam.

Formol Titration for Casein, (Walker test, Sorenson's titration)—

1. Add 4 ml. of formaldehyde and 1 ml. of phenolphthalein to 17.6 ml. of distilled water. Add 0.1N NaOH from the burette until it matches that of the color comparison rod. This amount of alkali is the formaldehyde acidity correction factor.

2. Pipette 17.6 ml. of milk at 70° F. and add 1 ml. of phenolphthalein.

3. Add 0.1N NaOH from the burette until the color matches that of the comparison rod.

4. Add 4 ml. of formaldehyde to the neutralized sample and a white color results.

5. Adjust the burette level to 0 and again add alkali to the decolorized sample until the desired pink color is obtained.

6. Note the burette reading—subtract the formaldehyde correction factor.

7. Multiply the result by 0.8335 to get the per cent casein in the sample.

The number of free NH_4 groups is reflected in the increased titer obtained with a standard alkali as a result of destroying these basic groups by reaction with formaldehyde.

Freezing Point Test—See Hortvet Cryoscope.

Frost's Cellular Test—A test devised by W. D. Frost for determining whether or not milk has been pasteurized. The sample of milk is mixed with an equal quantity of methylene blue stain. This mixture is allowed to stand for at least 10 minutes and is then centrifuged. The sediment is then spread on a slide, dried and examined under a microscope. Slides from raw milk show a blue background with unstained leucocytes as clear areas, whereas slides of milk which has been heated to 145° F. and held for 20 minutes or longer show well stained nuclei of leucocytes against a clear background.

Fucoma Test—See Gerber test.

Gelatin in Dairy Products, Determination of—An acid solution of mercuric nitrate is prepared in twice its weight of nitric acid of 1.42 sp. gr., and this solution is diluted to 25 times its bulk in water. To 10 cc. of the milk (or cream) to be examined, is added an equal volume of the acid mercuric nitrate solution, the mixture is shaken, 20 cc. of water is added and the mixture is shaken again and allowed to stand 5 minutes, then filtered. If much gelatin is present, the filtrate will be opalescent and cannot be ob-

tained quite clear. To a portion of the filtrate contained in a test tube an equal volume of a saturated aqueous solution of picric acid is added. A yellow precipitate will be produced in presence of any considerable amount of gelatin while smaller amount will be indicated by cloudiness. In the absence of gelatin the filtrate obtained will remain perfectly clear.

Gerber Test for Fat—A test for butterfat in milk and milk products using sulfuric acid and amyl alcohol as reagents. It was perfected by Dr. N. Gerber, a Swiss chemist and is widely used in European countries.

The sulfuric acid dissolves the solids other than fat, liberates the fat and creates heat to keep the fat in a liquid condition. The amyl alcohol prevents the charring of the fat and facilitates a clear fat column. The fat after chemical liberation from the other milk solids is separated by centrifugal force as in the Babcock Test.

Milk Plain or Homogenized—

Apparatus

- 1 Gerber milk test bottle (butyrometer) with solid or nipple type rubber stoppers
- 2 Gerber milk pipette calibrated to deliver 11 ml of milk at 60° F (15.6° C)
- 3 Automatic acid measure for dispensing 10 ml charges
- 4 Automatic amyl alcohol measure for dispensing 1 ml charges

Gerber or Babcock centrifuge

Note: Babcock centrifuges must be equipped with cup adapters to accommodate the Gerber test bottles and must be heated as for Babcock test.

- 6 Filling and shaking rack.
- 7 Tempering bath maintained at 135-140° F (57.2-60.0° C)

Reagents

- 1 Sulfuric acid (H_2SO_4) sp gr 1.820-1.825 at 68° F (20° C)

Note: Proper strength of H_2SO_4 , since the test bottles hold and must contain a definite milk acid/amyl alcohol volume which precludes the addition of a smaller or larger milk acid/amyl alcohol volume which precludes the addition of a smaller or larger charge of acid to compensate for stronger or weaker concentration of acid.

- 2 Amyl alcohol sp gr 0.815-0.818 b.p. 262 to 270° F (127.8-132.2° C) free from fat, furfural or any substance that might appear in the fat column after centrifuging.

Note: Keep amyl alcohol in well-stoppered brown glass bottles and in a cool dark place.

Procedure

- 1 Transfer 10 ml of H_2SO_4 at 60-70° F (15.6-21.1° C) to the Gerber milk test bottle.

2 Measure into the test bottle by means of the Gerber milk pipette 11 ml of the well-mixed milk sample allowing it to flow slowly down the side of the test bottle to form a distinct layer above the acid.

3 Add 1 ml of amyl alcohol to the test bottle and if necessary before mixing adjust the unmixed contents to 60-70° F (15.6-21.1° C) by partial immersion in a water bath.

Note: Always add amyl alcohol after the milk, never allowing it to contact the H_2SO_4 , directly for this will cause an imperfect test.

4 Tighten the stopper and mix by shaking the bottle at a 45 degree angle until all visible curd has been dissolved (about 2 min). Next with the flat band in the vertical plane, invert the bottle several times to insure homogeneous mixing of the entire bottle contents.

Note: It is extremely important to shake the bottle at a 45° angle before inversion. This allows 8 of the 10 ml of H_2SO_4 to mix with the 11 ml of milk and brings about solution of the solids not fat without any tendency to burn the sample. Keeping the flat band of the bottle in the vertical plane during inversion will bring the acid/milk/amyl alcohol mixture to homogeneity in a minimum of time.

4a For homogenized milk shake as above for an interval sufficient to dissolve all visible curd and then shake additionally for a period at least 50% longer before inverting the bottles to mix the remaining contents.

Note: The additional shaking aids in liberating all of the small fat globules in homogenized milk thus to permit them to agglomerate and rise more readily.

5 Place the test bottle in the centrifuge and with the machine balanced, whirl for 5 minutes at the proper speed.

Note: Proper speed for Gerber centrifuge is 1,000 rpm. Babcock centrifuge speed should be adjusted to speed recommendations as in Babcock test for milk and heated as stated in the Babcock test.

6 After centrifuging, temper the bottles in the water bath at 135-140° F (57.2-60.0° C) for 5 minutes and then holding the bottle vertically immediately adjust the bottom meniscus (flat meniscus) to zero or the nearest whole percentage graduation and observe the reading from that point to the lowest part of the upper meniscus.

Galcreas Phosphatase Method—A method for determining phosphatase in milk in which the phenol liberated from disodium phenyl phosphate is detected by means of Folin-Ciocalteu's reagent. The color is evalu-

ated by means of permanent color standards.
See Phosphatase Test.

Gravimetric Test—The gravimetric test is the most reliable method for determining total solids in milk and the one generally relied upon in court procedure. The percentage of total solids is determined by weighing a small sample of milk in a small dish on a chemical balance and then evaporating the moisture until trial weights show that the residue has reached constant weight. The percentage of total solids is then calculated. For making approximate tests, the lactometer is used.

Guaiaac Test—A test for heated milk which is based on the detection of the enzyme peroxidase. To 5 ml. of milk in a test tube are added a few drops of saturated alcoholic solution of guaiaac, allowing the latter to flow down the side of the test tube on to the surface of the milk. Then a few drops of 0.2% H_2O_2 are added. A positive test is indicated by the development of a blue color.

Hall Test—A test for measuring the gel strength of gelatins by means of a falling plunger, the resistance to which is indicated by a pointer on a graduated scale. The test is not used to any great extent today.

Harland-Ashworth Method—A method for determining the undenatured serum protein content of milk by precipitating the casein and denatured proteins by saturation with NaCl. The undenatured serum proteins may be determined in the NaCl filtrate by Kjeldahl analysis or preferably turbidimetrically by acidifying the NaCl filtrate with HCl.

Harris Rennet Test—A test to determine the strength of rennet solutions. An 8 oz. sample is taken from the cheese vat at 86° F. and placed in a conical glass graduate. The time is noted and ½ dram of rennet mixed with ½ dram of water is added. The mixture is stirred with a thermometer for 5 to 10 seconds and the time noted when the milk first thickens. (One ounce equals 8 drams.) This test is now more or less obsolete.

Heat Lamp Moisture Test—A rapid moisture test for cheese. A 250 watt bulb with a built in reflector is placed 2-3 inches above the sample. A 5 gram sample of cheese is used. A disposable aluminum cup is most convenient for the test. After a warm-up period of 15 minutes for the lamp, the weighed sample of Cheddar cheese is dried

for 18 minutes and re-weighed. Different time periods are used for other types of cheese. To check to completeness of drying, the dried sample should be cooled, weighed, reheated for 4 minutes and again cooled and re-weighed. The sample may be regarded as dry if the weight lost in the 4 minute period does not exceed 0.05% of the weight of the original sample. For cheese foods and cheese spreads, the disappearance of the light color for a chocolate brown is a good indication of the end point of drying. This test approximates 0.5% of the actual moisture of the cheese.

Heated Milk, Test for—See Paraphenylene-Diamine Test.

Hilker-Guthrie Sour Cream Body Tester—Consists of a small stand with an arm that can be easily raised or lowered; a graduated plummet weighing 14.5 grams, ½ in. in diameter and 4½ inches long; a tool for levelling the cream; and one pint sour cream bottle. The test is made by releasing the plummet and reading the depth of penetration—takes only 2 seconds—made by Mojonier.

Hill Test for Soft Curd Milk—A simple test for determining softness of the curd in milk. The milk is coagulated in an 8 oz. jar in which has previously been placed a star-shaped curd knife. After a 10-minute coagulation, the knife is drawn through the curd by means of a spring balance which records in grams the pull required to cut the curd.

Details of the test follow:

1. 100 cc. of the thoroughly mixed milk are placed in an 8 oz. jar and the temperature of the milk brought up to 95° F. and maintained there.
2. The knife is placed in the jar and 10 cc. of freshly mixed coagulant are added while agitating the jar moderately to give the milk a circular motion to mix it with the coagulant.
3. The jar should rest in the waterbath for 10 minutes without being agitated.
4. The spring balance is hooked through the loop in the curd knife and, by slow and even tension, the knife is drawn through the curd. The amount of tension required is read directly on the balance.

This test has been modified in recent years. See Curd tension of milk. A.D.S.A. Official Method J.D.S. 21-825 1911.

Horral and Elliker Test—See Starter Activity Tests.

Hortvet Cryoscope—The freezing point of milk can be determined with the aid of a Beckmann thermometer using standard procedures in common use in physico-chemical laboratories. However for the sake of convenience Hortvet devised a special cryoscope for this purpose. The Hortvet cryoscope has been adopted as official for detecting added water in milk and detailed directions for this purpose are given in Official Methods of The Association of Official Agricultural Chemists.

Hot Iron Test—A test for measuring the acidity of the curd in cheesemaking. It is said to have been invented in 1815 by L. M. Norton of Goshen, Connecticut. A clean iron bar 2 to 3 feet long is heated in a flame until one end is scorching hot while the other can be held in the hand. By trial a point on the bar is found where a block of curd will stick and turn dark brown or black in 5 to 10 seconds. The acidity is indicated by the length of the fine threads spun out to breaking point as the curd is applied to the iron at this point for 2 or 3 seconds then drawn away. The whey is drawn when the threads are $\frac{1}{4}$ inch long and the curd is salted when threads are $\frac{3}{4}$ to 2 inches long.

Hot Water Test (Cheese)—Italian curd is placed in hot water to determine the proper time for kneading. When ready it should stretch in a very fine string when pulled apart.

Hotis Test—A test originated by R. P. Hotis and used in detecting mastitis-infected milk. The method consists in adding 0.5 cc. of sterile 0.5% aqueous solution of brom cresol purple to 9.5 cc. of milk carefully collected directly from the animal. After the sample is mixed it is incubated for 24 hours at 37.5° C (99.5° F) and the results observed. The characteristic change in the color of the sample after incubation together with the occurrence of flakes or balls of growth indicates the presence of *S. agalactiae*.

Kjeldahl Method—A method for determining nitrogen and protein based upon the decomposition of the nitrogenous material when it is boiled with strong sulfuric acid and various catalysts. The nitrogen present is converted into ammonium sulfate. The sulfuric acid is then neutralized with sodium hydroxide the nitrogen liberated and distilled into a known excess of standard acid. After titration with the standard acid the amount of nitrogen is converted into its

protein equivalent by multiplying the percentage nitrogen by 6.37, since the protein of milk contains approximately 15.7% nitrogen.

Kulaseff Test—A modified Babcock method for the determination of fat in ice cream. The method requires two reagents. Reagent (1) contains water, sodium hydroxide sodium tartrate and ammonium sulfate. Reagent (2) contains ethyl alcohol N butyl alcohol ammonium hydroxide, ethyl ether and petroleum ether.

Kohman Method—A simple, rapid and accurate test for determining the moisture fat salt and curd content of butter. A 10 gram sample of butter is used. Moisture content is determined by heating slowly on a hot plate or over a low flame. The fat is then extracted from the residue by washing with gasoline. Salt is determined by adding 100 cc of water to the residue remaining from the fat test and titrating 25 cc of this solution with silver nitrate solution. The residue then remaining represents the amount of curd.

Kreis Test—A test for determining oxidized flavor in milk fat. For this test an ether solution of phatoglucin and concentrated hydrochloric acid are shaken in a test tube with the fat to be tested for oxidation. From the intensity of the reddish pink color which appears in the watery layer in the test tube can be determined the degree of autooxidation of the unsaturated acids especially oleic.

Laboratory Pasteurization Test—A common test used by large dairy companies to determine to what extent the bacteria present in the milk from each farm will be destroyed by pasteurization. A 10 cc. sample of each milk is placed in a test tube and the tube placed in a hot water bath the temperature of the water in the bath is brought to the pasteurization temperature and held for the required time then the sample is cooled after which the bacterial content is determined by the official agar plate method. Used as a check on plant pasteurization.

Laboratory Test—See Sharer Field Test.

Line Run Test—Same as "Processing" test. A test used to determine the sources of contamination in a plant to check the effectiveness of sterilization and to check the efficiency of pasteurization. Samples of milk cream or mix are taken at certain points in progressive order in the direction of the flow of the products through the plant. The usual plate counts are then made.

Mann's Acid Test—A method for measuring the acidity of milk, developed by Dr. A. G. Mann of the Illinois Exp. Sta. in 1890. The apparatus necessary for the test is a 50 cc. burette graduated to 0.1 cc. It has a rubber tube and pinch cock at the lower end. Also needed are a 17.6 cc. pipette, a glass stirring rod, a white cup, phenolphthalein indicator, and $\frac{1}{10}$ Normal sodium hydroxide. To operate the test: With the pipette 17.6 cc. of the milk sample are placed in the white cup, 3 to 5 drops of indicator are added and stirred thoroughly. The burette is filled with the NaOH and the height at which the alkali stands in the tube is observed. Slowly and with constant stirring the alkali is run into the sample. When a faint pink color appears, all the acid has been neutralized and the burette is again read. Then the total amount of NaOH used to neutralize the sample is computed. To obtain the percentage of acidity, the following formula is used:

$$\% \text{ acid} = \frac{\text{cc. NaOH used} \times .009 \times 100}{\text{no. of grams in sample}}$$

(.009 = the no. of grams of lactic acid neutralized by 1 cc. of alkali solution.)

Marshall Rennet Test—A test used for determining the ripeness of milk for cheese making, made first after adding starter and again after an elapse of time. A special cup is filled with milk to a point marked "zero." Dilute rennet extract is then added and mixed with the milk. In the bottom of the cup is a hole, out of which the milk will run until coagulation takes place. The time required to coagulate the milk is shown by the scale on the wall of the cup. This test is more sensitive to slight changes in acidity than the acidity test. The cheesemaker uses this test to indicate the increase in acidity after the addition of starter. After a change in the units or portion of a unit, the cheesemaker has an indication of the increase of acidity and he will then set the milk.

Melting Test, Meltdown Test—A test for the melting properties of process cheese and cheese foods. A disc of cheese of specified size and thickness is melted on a petri dish. The melted sample is checked for amount of spreading and freedom from oiling off. The test gives some indication as to how the cheese will behave in grilling or in home cooking.

In one such test, a $\frac{1}{2}$ inch plug is steamed for 10 minutes. The ideal product should be completely melted in this time.

Methylene Blue Reduction Method (Reductase Test)—A test to determine the quality of milk in regard to bacterial content, by adding methylene blue to the milk and noting the length of time necessary to decolorize the milk. The longer it takes to decolorize, the better the quality of the milk.

Microscopic Colony Count (Little Plate Method)—The general procedure for making this count is as follows: a small amount of milk, 0.05 ml. is mixed with liquefied agar at about 113° F. on a sterile glass slide and the mixture is spread over an area approximately 4 sq. cm. After hardening, the slide is held in a moist chamber for 3 hrs. or more to permit the organisms to develop, then it is cooled, stained with methylene blue, and the colonies in various fields are counted under a microscope. Thus the number of colonies per milliliter of the milk is counted. The principal advantage is that it is rapid and requires only a small amount of glassware and medium.

Milk Bottle Gage Method—An approximate method for measuring the cream volume in a bottle of milk. The cream volume gage may be of metal, celluloid, or compressed paper. It is so constructed as to conform to the shape of the neck and shoulder of a quart or pint milk bottle. The gage is calibrated to read directly in percentage. The cream volume is determined by placing the gage in position and reading the percentage in volume directly at the point where the cream line meets the gage.

Minnesota Test—A modified Babcock test for determining the fat content of ice cream in which a non-acid reagent is used. See Milk Industry Foundation Manual.

Moisture Test—Drying lamp. See Heat Lamp moisture test.

MOJONNIER TEST FOR FAT

An ether extraction method for determining the fat content of dairy products. It is similar to the Roes-Gottlieb method but instead of the various hand operations of the latter test, it makes use of the special apparatus of the Mojonnier Tester such as drying ovens, cooler-desiccator, and the centrifugal machine, and thus saves much time in the laboratory. While the Babcock test, owing to its simplicity and greater speed, is largely used for milk and cream, the Mojonnier test is more generally used for ice cream, evaporated milk, condensed milk and other dairy products which are difficult to test by the Babcock method.

Milk, Skim Milk, Buttermilk and Whey—
Apparatus

Complete Mojonnier milk tester with chemical balance which includes a quantity of fat dishes extraction flasks and 1 2 5 and 10 gram pipettes

Reagents

1 Distilled water Free from oil or any kind of mineral residue

2 Ammonium hydroxide concentrated NH_4OH c.p.

3 Grain alcohol 95% 190 proof 0.8164 sp gr at 60° F (15.6° C) It should leave no residue on evaporation

4 Ethyl ether USP quality should contain not more than 4% of water sp gr 0.713-0.716 at 77° F (25° C) boiling point about 95° F (35° C) should leave no residue on evaporation

5 Petroleum ether purified sp gr 0.638-0.660 at 77° F (25° C) boiling point 120-140° F (49-60° C) should leave no residue on evaporation

Caution Both ethyl and petroleum ethers are highly inflammable and explosive and the utmost care must be used in handling. Store in a cool place and do not permit smoking open flames or electrical equipment which causes sparks where these reagents are handled. Purification of these ethers by redistillation is of doubtful value extremely dangerous even in experienced hands and is considered inadvisable.

Note If there is any doubt as to the purity of the reagents blank determinations using distilled water instead of milk should be made and repeated as frequently as necessary. The best guarantee of purity is a reliable source.

Procedure

1 Mix the sample thoroughly by pouring several times from one vessel to another. Should the fat be in a hardened condition or tend to adhere to the sample container the sample should be slowly warmed to a temperature not exceeding 100° F (37.8° C) thoroughly mixed then cooled to 60-70° F (15.6-21.1° C) before sampling.

Frozen or partially soured milk may be prepared for sampling by slowly warming to 100° F vigorously mixing and quickly sampling. Such samples should be run in duplicate.

2 Weigh a 10 gm sample into a properly labeled extraction flask using a 10 gm pipette.

For First Extraction

1 Add 1.5 ml of NH_4OH and mix thoroughly. The NH_4OH neutralizes any acid present and dissolves the casein.

Note A few drops of phenolphthalein in

indicator will help to sharpen the division line.

2 Add 10 ml of 95% grain alcohol insert the cork and shake for 1½ minutes. The alcohol prevents the formation of a jelly or colloid like substance which always forms when ethyl ether is added without the presence of alcohol.

Precaution When shaking the contents of the extracting flask keep the hand or finger over the cork to prevent leakage or spillage. Also keep the flask with the large bulb down so as to insure that the contents are all thoroughly mixed and shaken.

3 Add 2 ml of ethyl ether insert the cork and shake for 1½ minutes. The ethyl ether dissolves the fat.

4 Add 2 ml of petroleum ether insert the cork and shake for 1½ minutes. The petroleum ether takes out the last traces of moisture from the ethyl ether extract and also aids in dissolving the fat.

5 Centrifuge thirty turns taking ½ minute.

6 Pour off the ether mixture containing the extracted fat into a fat dish which has been heated to 275° F (135° C) in the fat oven for 5 minutes subsequently cooled in the fat cooling desiccator for 7 minutes and weighed to the nearest 10 mg.

Precaution When decanting the ether solution into the dishes be very careful not to pour any suspended solids into the dish.

For Second Extraction

7 Add 5 ml of alcohol to the residue in the flask and shake.

8 Add 1 ml each of ethyl and petroleum ether inserting the cork and shaking for 30 seconds after the addition of each reagent.

9 Centrifuge thirty turns taking ½ minute.

10 Pour off the ether mixture into the same fat dishes as were used for the first extraction taking care not to pour off any of the residue below the ether solutions.

Note Before pouring off the ether mixture if the level of the residual water layer is below the neck of the flask between the two bulbs add sufficient distilled water to bring the level about half way on the neck so that after decanting a minimum of ether mixture remains in the flask.

11 Evaporate the ether from the fat dishes on the electric hot plate at 275° F (135° C).

Precaution Ether fumes are dangerous and must not be allowed to spread through the room. Always keep the cover over the hot plate when evaporating the ether and have the proper exhaust pipe taking the

fumes from the tester to out doors. Do not permit smoking in the laboratory as ether fumes are very inflammable.

For Third Extraction

12. Make a third extraction in the same manner as the second, omitting the addition of alcohol.

13. Remove the last traces of ether in the vacuum oven at 275° F. (135° C.) for 5 minutes with not less than 20 inches of vacuum.

14. Cool the dishes in the cooling desiccator with the circulating water at room temperature for 7 minutes. If there are several dishes in the oven, it is advisable to increase the time of cooling to 10 minutes.

15. Weigh rapidly and record the weight of fat. All weights should be recorded to the fourth decimal place.

$$\text{Percentage Fat} = \frac{\text{Weight of fat}}{\text{Weight of sample}} \times 100$$

Cream (Mojonnier)

Apparatus and Reagents

Same as given for Milk, Skim Milk, Buttermilk and Whey.

Procedure

1. Adjust the sample to room temperature and mix thoroughly by pouring several times from one vessel to another.

Precaution: Cream in which the fat has become hardened may be brought into the proper condition for mixing by slowly and thoroughly warming to a temperature not exceeding 100° F. (37.8° C.). Should the milk fat be separated or churned, heat the cream to 105-110° F. (41-43.3° C.); shake it thoroughly, and immediately weigh out the test portions. In such cases duplicate samples are imperative.

2. Weigh 2 gm. of the well mixed sample into a properly labeled extraction flask.

Note: It is not necessary to use exactly 2 gm. but actual weights should be recorded to the fourth decimal place. In case of the cream containing over 25% milk fat, a 1 gram sample is used.

3. Add 5 ml. of distilled water to the sample in the extraction flask and mix well.

Note: Add 6 ml. of distilled water for cream testing over 25% milk fat.

4. Add 1.5 ml. of NH_4OH and proceed with the remainder of the test as for milk except that 25 ml. of ethyl and of petroleum ether must be added in making the second extraction.

Ice Cream—

Apparatus and Reagents

Same as given for Milk, Skim Milk, Buttermilk and Whey.

Procedure

1. Adjust the sample to room temperature and mix thoroughly by pouring several times from one vessel to another.

Precaution: Fruited ice cream and samples containing nuts are difficult to sample. Care should be taken to get even distribution of fruits or nuts.

2. Weigh a sample of about 5 gm. (recording the weight accurately) into a properly labeled extraction flask.

3. Add 5 ml. of distilled water, mix well, and proceed as for milk except that 25 ml. of ethyl and of petroleum ether must be added in making the second extraction.

Evaporated Milk, Condensed Buttermilk and Unsweetened Condensed Milk—

Apparatus and Reagents

Same as given for Milk, Skim Milk, Buttermilk and Whey.

Procedure

1. Adjust the sample to room temperature and mix thoroughly by pouring several times from one vessel to another.

Note: In case of heavy superheated products and canned evaporated milk it may be necessary to warm the sample to 90-100° F. (32.2-37.8° C.). Should the milk fat be separated or churned, heat the sample to 100-110° F. (37.8-43.3° C.); shake it thoroughly and immediately weigh the 3 gm. test portions. In such cases duplicate samples are imperative.

2. Weigh a sample of about 5 gm. (recording the weight accurately) into a properly labeled extraction flask.

3. Add 6 ml. of distilled water and proceed as for milk except that 25 ml. of ethyl and of petroleum ether must be added in making the second extraction.

Sweetened Condensed Milk—

Apparatus and Reagents

Same as given for Milk, Skim Milk, Buttermilk and Whey.

Procedure

1. Adjust the sample to room temperature and mix thoroughly.

2. Weigh a sample of about 5 gm. (recording the weight accurately) into a properly labeled extraction flask.

3. Add 8 ml. of hot distilled water and shake thoroughly.

4. Proceed with the remainder of the test in the same way as for milk except that 25 ml. each of ethyl and of petroleum ether must be added in making the second extraction.

Butter, Cheese, Malted Milk, Chocolate and Cocoa—**Apparatus and Reagents**

Same as given for Milk Skim Milk Buttermilk and Whey

Procedure

1 Thoroughly mix the sample. In the case of cheese and milk chocolate it is suggested that the sample be cut up into very small particles

2 Weigh the sample portion directly in to the extraction flask. In the case of malted milk chocolate and cocoa use a 0.5 gm sample. In the case of cheese and butter use a 1 gm sample

3 Add 8 ml of hot distilled water

4 Add 1.5 ml of NH_4OH (3 ml in the case of cheese) and proceed with the remainder of the test in the same way as for milk except that 25 ml each of ethyl and of petroleum ether must be added in making the second extraction

Dry Skim Milk, Buttermilk Powder and Whole Milk Powder—**Apparatus and Reagents**

1 Same as given for Milk Skim Milk Buttermilk and Whey

Procedure

1 Thoroughly mix a representative sample

2 Weigh a 1 gm sample directly into the extraction flask

3 Add 9 ml of hot distilled water. Shake vigorously until dissolved

4 Add 1.5 ml of strong ammonium hydroxide (3 ml in the case of buttermilk) and proceed with the remainder of the test in the same way as for milk.

Possible Causes for High Fat Tests—

1 Not keeping the bottom of the dishes flat

2 Improper shaking and centrifuging shown by nonfatty residue in the dish

3 Impure reagents (if in doubt run a test on the reagents substituting distilled water for milk)

4 Temperature in fat oven too low

5 Contamination of the dish after the ether was poured into it

6 Improper reading or posting of weights

7 Weights becoming lighter because of wear

8 Weighing the dish containing the fat at a lower temperature than prevailed when the dish was weighed empty

Note: Weights should be calibrated at regular intervals with Bureau of Standards reference weights.

Possible Causes for Low Fat Tests—

1 Leaky corks. Use the best corks obtainable

2 Insufficient shaking

3 Adding too much water or too little alcohol

4 Having the dividing line too low so that too much ether is left behind. If such is the case add more water to bring the line to the proper height before pouring off or make a third extraction

5 Too high temperature in the vacuum oven

6 Insufficient water circulating through the cooling desiccator. The water tank must be kept filled and the circulating pump must be kept in good working order

7 Improper reading or posting of weights

8 Spattering of the fat in the oven due to transferring the dish to the oven before the ether solution has all evaporated or due to too high heat carried in the vacuum oven

9 Weighing the dish at a higher temperature than prevailed when the dish was weighed empty

Mojonnier Test for Total Solids Milk, Skim Milk, Buttermilk and Whey—**Apparatus**

Complete Mojonnier total solids tester with chemical balance which includes a quantity of Mojonnier solids dishes a dish cover a dish contact maker a quantity of 1 gm pipettes and a pair of tongs

Reagent

Distilled water

Procedure

1 Mix the sample thoroughly by pouring several times from one vessel to another

2 Weigh with cover in place a 2 gm sample to the fourth decimal place into a solids dish which has been heated for 10 minutes in the solids oven at 212°F (100°C .) subsequently cooled for 5 minutes in solids cooling desiccator and weighed. Make all weighings to the fourth decimal place and with the cover on the solids dish record (a) weight of dish (b) weight of sample

3 By gently tilting the dish spread the milk in a thin film over the entire bottom

4 Place the dish on the hot plate at 356°F (180°C .) and heat until the residue begins to turn light brown. Insure uniform evaporation by using the dish contact maker

5 Transfer the dish to the solids vacuum oven at 212°F (100°C .) Heat for 10 minutes under not less than 20 inches of vacuum

6 Cool in a cooling desiccator with water circulating for 5 minutes

7. Weigh the dish and solids with the dish covered. Record the weight of the solids.

$$\left. \begin{array}{l} \text{Percentage} \\ \text{of Solids} \end{array} \right\} = \frac{\text{Weight of Solids}}{\text{Weight of Sample}} \times 100$$

Butter—

Apparatus

Same as given for Milk, Skim Milk, Buttermilk and Whey.

Procedure

1. Weigh a sample about 1 gm. directly into a dish.

2. Add no water and proceed as for milk.

Cheese—

Apparatus and Reagent

Same as given for Milk, Skim Milk, Buttermilk and Whey.

Procedure

1. Weigh a sample of about 0.5 gm. directly into dish.

2. Weigh with the dish a blunt pointed glass rod that can be used to break up the cheese lumps.

3. Add 1.5 ml. of hot distilled water and with the blunt pointed glass rod break up the lumps of cheese so as to insure an even film of the sample and added water over the entire bottom of the dish. The glass rod is left in the dish for the entire determination.

4. Proceed as for milk except that the sample is dried for 20 minutes in the vacuum oven.

Possible Causes for High Total Solids Tests—

1. The bottoms of the dishes were not kept level.

2. Incomplete evaporation on the solids hot plate or evaporation at too low a temperature. Do not remove the dish until all visible moisture has been evaporated and the first trace of brown color appears.

3. Improper reading or posting of the weights. Weights light because of wear. Frequent calibration with Bureau of Standard reference weights is suggested.

4. Contamination of the dish after the sample had been weighed into it.

5. Low vacuum oven temperature.

6. The vacuum not up to standard.

7. Too large a sample was taken, rendering it impossible to remove all the water under standard conditions.

8. Weighing the dish with the solids in it at a lower temperature than prevailed when the empty dish was weighed.

Possible Causes for Low Total Solids Test—

1. The sample was browned too much because of too long an exposure or the use of too high a temperature on the hot plate.

2. Operating vacuum oven above 212° F. (100° C.).

3. Milk spattered from the dish. This will not happen if the temperature is kept at 356° F. (180° C.).

4. Improper reading or posting of the weights.

5. Water was not running through the desiccator.

6. Weighing the dish with the solids in it at a higher temperature than prevailed when the dish was weighed empty.

Monrad Rennet Test—A test used by cheese makers for determining the ripeness of milk. Five cc. of dilute rennet solution are quickly added to 160 cc. of milk which has been heated to a temperature of 86° F. Milk which is sufficiently ripe for Cheddar cheese making will generally coagulate in 30 to 60 seconds.

Moore Test—A color test for lactose. When dissolved in caustic alkali, pure lactose will give a yellow color.

Nitrate Test for Watered Milk—Ferrous sulfuric solution used to determine whether milk has been watered. Since most of the nitrates found in water are not found in milk, it is possible to conclude from their detection that milk has been adulterated by added water. Even in the presence of infinitely small traces of water containing nitrates there will be shown a clearly defined blue-purple ring because of the stratifying effect of the reagent.

Olive Oil Test for Moisture—Quick Test—Heat 20 ml. of high grade olive oil and 1 gram of common salt in an aluminum dish over a low gas flame until the oil fumes slightly.

Cool and weigh on a torsion balance. Add 5 grams of finely ground cheese. Heat oil and cheese mixture over a low gas flame for 5 or 7 minutes or until bubbling ceases.

The dish and contents during heating should be shaken gently to prevent the cheese from sticking. The dish and contents are cooled and weighed. This test gives a good approximation of the moisture.

Oiling Off Test For Cream (Mack and Jenkins Test)—

Apparatus

1 Babcock skim milk test bottle of type with stem extending down into bottle proper to within $\frac{1}{2}$ inch of bottom and stem should have no side hole in base of neck as in some styles

2 Fabcok centrifuge

3 Pipette 1 ml

Procedure

1 With pipette measure 1 ml of cream into a skim milk test bottle

2 Add water at least 200° F (93° C) to within $\frac{1}{2}$ inch of the base of the neck. Mix thoroughly while adding

3 Centrifuge for not longer than 10 seconds at the standard Babcock centrifuge speed

4 Remove the bottle from the centrifuge and tap the side of the bottle with the finger to break the very thin film of cream which has collected on the top. Do not agitate

Note If the machine is whirled longer than ten seconds a thick film will form on top which will be difficult to break and the pieces will clog the graduated neck

5 Add water at 200° F (93° C) or above and bring the column up to the top of the neck and centrifuge for 5 minutes

6 Read the oil layer as soon as the bottle is removed from the centrifuge. Each small division of the graduated scale should be read as 1

Interpretation Creams yielding a reading of 3 or more with this test will show a noticeable separation when used in coffee

Paraphenylene Diamine Test — See Storch Test

Patrick Test—A butter moisture test similar to the Irish Test. An aluminum cup containing the sample of butter of known weight is held by a hand clamp directly over the flame of an alcohol lamp or gas burner until the water has all been evaporated. The weight is again recorded and the percentage loss is taken as the moisture percentage of the butter. Care should be taken to heat the butter slowly to avoid sputtering and consequent loss of some of the sample

pH Determination of Cheese—The quinhydrone electrode provides the most convenient and accurate measurement for determining cheese pH

The glass electrode may be used but it is subject to salt and protein errors. For a detailed discussion of procedure and apparatus see Cheese Van Slyke and Price 1919 pages 47-48

Phosphatase Test—A test to determine whether or not milk has been pasteurized properly. It is based on the property of the heat sensitivity of the enzyme phosphatase to liberate phenol from di-sodium phenyl phosphate and then the determination of the phenol quantitatively by a delicate color reaction. This test can detect the addition of as little as 0.25% raw milk to a properly pasteurized milk or reveal a pasteurizing error of 1.5° F underheat. This method first developed by Kay and Graham now has several modifications the best known of which is Scharer's modification

Phosphatase Test, Scharer Method of—A widely used method for the phosphatase test. It involves the use of a disodium phenyl phosphate substrate and detection of the liberated phenol colorimetrically with 2,6-dibromoquinone-chloromide (BQC). The color produced is evaluated by comparison with permanent color standards. Described fully in Dairy Laboratory Manuals

Phosphatase Test for Cheese—A test to determine if the milk used for making cheese or the cheese itself has been pasteurized at a temperature of not less than 145° F for a period of not less than 30 minutes or for a time and at a temperature equivalent thereto in phosphatase destruction. Cheddar cheese shall be deemed not to have been made from pasteurized milk if 0.25 gm shows a phenol equivalent of more than 3 micrograms when tested as specified by the Food and Drug Administration Service and Regulatory Announcements Food Drug and Cosmetic, No 2 Part 19

Different kinds of cheese and cheese of different ages have different buffering capacities and some of them require modifications of concentrations of the reagents. Therefore for testing different ages and varieties of cheese it is well to consult the above mentioned publication. When phosphatases act on biological materials an increase in inorganic phosphates occurs and the enzyme action can be followed analytically on this basis. Di-sodium phenyl phosphate is used as the substrate in all of the variations of the phosphatase test. Phenol is liberated and it lends itself to accurate colorimetric measurements

Phosphomonoesterase Test—Same as Scharer Method of Phosphatase Test

Pink Test—Many older cheesemakers use a so-called Pink test. It makes use of the same equipment as for Methylene Blue test plus the use of a .005% water solution of

Resazurin instead of Methylene Blue solution. The color changes from blue through lavender, pink and white. Blue indicates good milk, lavender fair, pink poor, and white very poor quality.

Polonowski & Martin Test (Human Milk, Test for)—A test which differentiates human from cow's milk, as follows: 1 cc. of milk is neutralized to phenolphthalein; 6 drops of methyl orange are added, and the milk is titrated with 0.01 NH_4SO_4 until the color changes. Human milk requires 2.5 cc. and cow's milk 10 cc. of acid to complete the reaction. In a mixture of cow's and human milk, the amount of each can be calculated by proportions.

Processing Test—See Line Run Test.

Publow Acid Test—A test to determine the acidity of milk. A tenth-normal solution of alkali is used to titrate against a 9-gram sample of milk. Each cc. of alkali solution used represents 0.1% of acid in the milk tested.

Purpurogallin Test—A test to determine peroxidase in milk, as follows: Place 2 cc. of fresh skim milk in a test tube, add 10 cc. of distilled water, 2 cc. of freshly prepared 5% solution of pyrogallin acid, and 2 cc. of 1% H_2O_2 (hydrogen peroxide) solution. Shake well, and pour paraffin oil on the surface to form a thin layer, so as to protect the solution from the air. A red precipitate of purpurogallin, which slowly increases on standing, indicates the presence of peroxidase.

Quick Test for Moisture—See Heat Lamp.

Quinhydrone Electrode for the pH of Cheese—Measurements of acidity of milk, whey and cheese can be made with a glass or a quinhydrone electrode. The quinhydrone electrode is more accurate for cheese due to salt and protein errors inherent in the glass electrode. For description of making and illustrations of, see Book on Cheese by Van Slyke and Price, 2nd edition.

Rapid Acid Test—A modified acid test for quickly determining whether milk or cream falls above or below a set standard of acidity. 17.6 cc. of milk or cream are mixed with 18 cc. one-fiftieth normal alkaline solution and the mixture is stirred or shaken. If the mixture remains faintly pink, it contains less than .18% acid; if it turns white, it contains more than .18% acid. An acidity in excess of .18% suggests the presence of considerable developed acidity. It is considered good condensing practice to adopt

a maximum acid limit of .18% titratable acidity.

Reductase Test—See Methylene Blue Reduction Method.

Rennet Test—See Marshall Rennet Test.

Resazurin Test—A reductase test, similar to the methylene blue test, but employing the indicator resazurin. The test is used to determine the sanitary quality of milk or cream.

There is a gradual transition in the color changes during the test from blue to pink to white. This test compares favorably with the methylene blue test if the readings are made at the so-called vivid pink stage. The results as shown by this test are obtained somewhat more quickly than with the methylene blue, and also the dye is much more sensitive to physiologically abnormal and pathological milks.

Roe-Gottlich Method—An ether-extraction method for the quantitative determination of fat. The Mojonnier modification of this test is largely used for milk and dairy products.

Rowland Method—A method for determining the nitrogen distribution in milk by means of the following analyses: (All analyses are made by the Kjeldahl method)

1. Total N.

2. Non-casein N (in filtrate obtained by precipitating the casein with acetate buffer at pH 4.6).

3. Non-protein N (in filtrate obtained by precipitating the proteins with trichloroacetic acid—(12%).

4. Proteose peptone plus non-protein N (in filtrate made as in #2 on sample that has been heated at 95° C. (203° F.) for 10-20 min.).

5. Globulin N (in precipitate obtained by saturating the casein free filtrate from #2 with MgSO_4).

Then:

Casein N = 1 — 2

Serum protein N = 2 — 3

Albumin + Globulin N = 2 — 4

Albumin N = 2 — (1 + 5)

Proteose-peptone N = 4 — 3

Globulin N = 5

Salt Test for Cheese, Volhard Method—Sample acid and grind the cheese. Weigh about 3 grams of cheese into a 300 ml. flask. Add 10 ml. of .1711/N silver nitrate solution. Add 15 ml. of nitric acid and 50 ml. of distilled water.

Heat to boiling. Add 3 lots of saturated potassium permanganate in 5 cc. portions. Boil until the cheese is completely dis-

solved and the mixture is clear Wash the precipitate 3 times with distilled water Add 3 ml of saturated ferric ammonium sulfate solution in the beaker Titrate with 1711/Λ potassium sulfocyanate A blank is run by omitting the cheese and adding sugar to react with the permanganate

ml AgNO_3 used — Potassium
sulfocyanate titer

% Salt = $\frac{\text{grams of cheese used}}{\text{sample after drying as in the moisture test}}$
This saves a weighing

This test may be determined on the sample after drying as in the moisture test This saves a weighing

Sanders and Sager Phosphatase Methods.—A modified series of methods for determining phosphatase in milk and dairy products It differs from the Scharer test in that barium borate hydroxide is used as a buffer instead of sodium tetraborate and that the proteins are precipitated with zinc or zinc-copper precipitants instead of lead A color development buffer consisting of sodium metaborate and sodium chloride is employed Sanders and Sager have given specific directions for almost all dairy products See MIF Laboratory Manual 2nd Ed

Schardinger's Test.—A test for heated milk based on the detection of Schardinger's enzyme (Xanthine Oxidase) To 20 ml of milk add 1 ml of a reagent consisting of 5 ml saturated alcoholic methylene blue 5 ml of formalin and 190 ml of distilled water Warm to 113-122° F and observe the time required for decolorization Normal milk decolorizes the methylene blue in about 10 minutes

Scharer Field Test.—A test for use especially by the field inspector to detect errors in pasteurization Add 0.5 ml of milk to 5 ml of buffered substrate contained in a test tube stopper the tube with a pure gum stopper shake well incubate for 10 minutes in a water bath at about 100° F or for 15-20 minutes in vest pocket stop incubation add 6 drops of BQC (Dibromoquinone chlorimide) solution and shake immediately Improper pasteurization is indicated by the appearance of a blue color

Scharer Method of Phosphatase Test.—See Phosphatase Test Scharer Method of

Schern Test.—A test for rennin inhibition of interest to cheese makers Milk from sick cows and colostrum milk require more rennin for coagulation than normal milk Five-tenths cc. of rennin dilutions are added to fresh milk samples These samples are placed in an ice chest for an hour and

then in a water bath at 37° C. (98.6° F) Normal milk will be found coagulated after this lapse of time while abnormal milk will not

Sediment Test.—A simple test for the detection of dirt and other sediment in milk. Using any one of several types of testers one pint of thoroughly stirred milk is strained through a cotton disk over an opening one inch in diameter The disk is then removed from the filter dried and observed for sediment

Sediment Test for Cheese.—See Extraneous Matter Test

Sediment Tester.—A simple apparatus designed to filter a pint of milk (the quantity adopted as the standard) in a very few seconds and collect the dirt from that pint on a standard size disk cotton filter 1 1/4" in diameter Dairy equipment houses handle this equipment

Sinacid Test.—A non acid test for butterfat in milk It uses a patented mixture of NaOH (caustic soda) sodium tartrate (Rochelle salt) instead of sulfuric acid After adding the mixture, the milk is heated to 200° F for 5 minutes before being centrifuged Not a popular test and not much used

Skim Milk Test, (Modified Babcock).—Use 20 cc. of sulfuric acid. Add about 2 1/2 of the acid shake until curd is dissolved add remainder of the acid and shake again Whirl 10 5 and 2 minutes to get out all the fat and continue the same as for whole milk.

Sorenson's Titration.—See Formal titration

Spoon Test.—See Foam Test

Stewart Slack Test.—A method used to determine the number of body cells in milk. It consists of placing 2 ml of milk in a tube which is closed at each end with a rubber stopper and whirled in a special centrifuge The stopper is removed from the cream end the cream layer broken with a wire and the milk poured out If the other stopper is then carefully removed the sediment will adhere to it The sediment is smeared over a definite area usually 4 sq cm dried and stained with methylene blue Then it is ready for examination under the microscope

Storch Test.—A test for heated milk which is based on the detection of the enzyme peroxidase To 5 ml of milk at 38° C.

(100.4° F.) add a few drops of 0.2% H_2O_2 solution and a few drops of freshly prepared 2% paraphenylene-diamine. Shake the tube. If peroxidase is present an intense blue color appears at once. A heat treatment of about 175-180° F. for 30 minutes is necessary to inactivate this enzyme.

Tillmans-Luckenbach Test—A test for the detection of neutralizers in cream. This method is based on the difference in buffer action, while passing through a given pH range, of the serum from a normal cream which may or may not be sour and that of a cream to which a neutralizer has been added.

Total Solids, Determination of—The lactometer affords a convenient and rapid means of testing a large number of milk samples for total solids. For borderline samples or where great accuracy is required, as for court cases, it is suggested that the Mojonnier or chemical method, as recommended by the Association of Official Agricultural Chemists, be used. See Lactometer.

Total Solids, Determination of by Lactometer—The milk sample (500 ml.) should be warmed to at least 40° C., held at this temperature for a few minutes, and completely mixed by gentle agitation. (Too much agitation of cold milk will cause an oiling-off when the milk is heated to 40° C.). A water bath is adjusted to a temperature of about 39° C. 350 to 400 ml. of milk is placed in a 500 ml. cylinder and the cylinder placed in the water bath. The 102° F. lactometer is wiped clean, and placed gently into the milk making sure it does not touch the cylinder at any point. The temperature of the milk is taken and adjusted to a final temperature of 38.9° C. (102° F.). The lactometer reading is taken at this temperature, reading to the nearest .1 lactometer degree. (Lactometer is graduated in 2 degrees.) The lactometer should be read at the top of the meniscus. The eye should be level with the top of this meniscus, even if it means reading through the water bath. A duplicate reading is not necessary, providing the temperature is accurately controlled to within $\pm .05^\circ C$.

Total Solids Determination Without Mojonnier Equipment—Mojonnier equipment frequently is not available in milk plant laboratories. In such cases, the simple but much longer procedure of drying the sample at 212° F. (100° C.) to constant weight may be followed.

Milk, Skim Milk, Buttermilk and Whey—

Apparatus

1. Drying oven or water bath.
2. Quantity of flat-bottom dishes and covers, 5 cm. in diameter.
3. Chemical balance equipped with weights.
4. Desiccator containing anhydrous calcium chloride, concentrated sulfuric acid or other suitable desiccant.

Procedure

1. Dry the flat-bottom dish in the drying oven at 212° F. (100° C.) for 10 minutes.
2. Place the dish in the desiccator and allow it to cool to room temperature.
3. Quickly weigh the dish with the cover to the fourth decimal place.
4. Pipette into the dish 3-5 ml. of a well mixed milk sample and weigh quickly with the cover on the dish, to the fourth decimal place.
5. Heat the dish and sample at the temperature of 212° F. (100° C.) until it comes to constant weight. The approximate time required is from 2 to 3 hours.
6. Cool in a desiccator to room temperature before each weighing.
7. Weigh rapidly, with the cover on the dish, to the fourth decimal place. The increase in weight of the dish over the empty dish is the weight of the solids in the sample.
8. Calculate the percentage of solids as follows:

$$\text{Percentage of solids} = \frac{\text{Weight of solids}}{\text{Weight of sample}} \times 100$$

Thus:

$$\begin{array}{r} \text{Weight of dish and milk} \dots\dots\dots 16.4235 \\ \text{Weight of dish empty} \dots\dots\dots 12.1345 \end{array}$$

$$\text{Weight of milk} \dots\dots\dots 4.2890$$

$$\text{Percentage of solids} = \frac{0.5418}{4.2890} \times 100 = 12.63$$

$$\begin{array}{r} \text{Weight of dish and dried milk} \dots\dots\dots 12.6763 \\ \text{Weight of dish empty} \dots\dots\dots 12.1345 \end{array}$$

$$\text{Weight of dried milk or solids} \dots\dots\dots 0.5418$$

Note: 1. The foregoing method is suitable for milk, skim milk, buttermilk and whey. For other products, such as ices, sherbets, ice cream, evaporated milk, plain condensed, sweetened condensed, cream, and dry milk containing more solids, reduce the size of sample in proportion and add hot distilled water to dilute to a milk-like consistency.

Note: 2. After the first weighing the dish and sample should be placed in the oven again for at least 1 hour and reweighed.

This process is repeated until two consecutive weighings differ by not more than 0.0002 gm that is constant weight

Trommsdorff Method—A method for determining the amount of body cells and sediment in milk. Ten cubic centimeters of milk are centrifuged for 10 minutes in a special centrifuge tube with a fine bore the bottom of which is calibrated. The amount of sediment is then read off directly.

Vest Pocket Test—The short time field test modification of the phosphatase test developed by Schärer. It derives its name from the fact that incubation of the tubes may take place in a vest pocket in the absence of a regular incubator.

Vitality Test—See Activity Test

Volhard Method—A wet digestion method for chloride determination. See Salt Test for Cheese.

Walker Test for Casein—See Formol Titration.

Werner Schmidt Method—A method often used in some parts of Europe quite similar to Roese-Gottlieb except that hydrochloric acid is used in place of sulfuric acid.

Whey Fat Test—Whey is tested in the same way as buttermilk except that 17.5 cc of acid H_2SO_4 are used.

Whole Milk Powder Fat Test—Dissolve 1 part of powder to 7 parts water and test the same way as milk. Divide result by 7 to make the necessary correction to the reading due to 7 parts water dilution in dissolving the powder.

Wijs Method—A method for determining the iodine number of fats and oils by means of a solution of iodine monochloride (I Cl). See Iodine Number.

Wisconsin Curd Test—A bacteriological test for determining the presence of undesirable organisms in milk for cheesemaking. Samples of milk are coagulated with rennin. A small pat of curd is then incubated at 37° C (98.6° F) for 10 or 12 hours at the end of which time it is examined for gas holes, sliminess, objectionable odors, etc.

Yeasts and Molds in Butter and Soft Cheese, Determination of—See Milk Industry Foundation Manual and Butter Institute Manual.

Dairy Type—Those characteristics of a dairy animal which connote milk and butterfat production. Characteristics usually considered include dairy temperament, constitution, body capacity, mammary development, and general appearance.

The body and back are longer and much narrower the thighs are thin the neck longer and more slender and in all parts the animal is lean and angular whereas the beef animal is thick fleshed and smooth. The dairy animal should present a muscular appearance without being at all beefy but should not be so low in flesh as in present an emaciated appearance. Both males and females are rather sharp at the withers deep ribbed fairly short of leg and are well divided between the hind legs.

In general there is correlation between type and production in dairy cattle but the correlation is not definite in all cases.

Dairy Utensils—A term given to the minor equipment in dairy plants. All dairy utensils should whenever possible be made of metals like stainless steel or metal covered with tin and should have well rounded seams so that they can be cleaned easily. Also there should be few cracks and crevices because of the possibility of bacteria lodging in them.

Dairying and Its Importance—The business of producing, processing and distributing milk and its products. In the widest sense it includes dairy farming, breeding and care of the dairy herd, processing of consumer milk, the manufacture of butter, cheese, ice cream, condensed, evaporated, powdered and fermented milks, whey and casein and other by products and the business of distributing and selling all these products. More than 80% of all farmers in the U S are somewhat involved in the feeding, care and management of dairy cattle. There are over 23 million dairy cows in the U S producing milk for human consumption or for the products made from milk.

Milk, plus the many products made from it is one of the most important food sources of our most civilized nations. It has been said that the more highly developed and healthy the people are the greater the amount of milk and dairy products consumed. Dr. McCollum has said "The keeping of dairy animals is the greatest factor in the history of the development of man from the state of barbarism." Many leading authorities of health matters have said over and over again that without milk the white race cannot survive. See Handbook Articles.

Dairying in Denmark—See Handbook, P. 242.

Dairyman—A dairy farmer; one who operates a dairy; also, one who markets dairy produce.

Daisies—Daisy Brick—See Cheese.

Dakins Solution—A neutral sodium hypochlorite solution.

Dallis Grass—See Feeds & Feeding.

Dam—The female parent of four-footed animals.

Damen—Gloire des Montagne—See Cheese.

Danish Cattle, Black & White—The Danish Black and White cattle are dual-purpose. In color they resemble the Holstein. They are strong in build and high in yield. The average weight is between 1000 and 1200 lb. The average fat content of their milk is about 3.7%.

Danish Cattle, Red—Like the Danish Black and White, the Danish Red are dual-purpose cattle developed mostly for milk production. The color is red or reddish brown. The cows are of medium size averaging about 1100 lb. in weight. Average fat content of their milk is between 3.6 and 3.9%.

Danish Export Cheese—See Cheese.

Danish Heater—See Milk, Processing and Processing Equipment.

Dariloid—See Sodium Alginate.

Dariworld Cheese—See Cheese.

Darso—See Feeds and Feeding.

Dash Churn—See Butter.

Daughter—The female offspring of an animal.

DDT (Dichlorodiphenyltrichloroethane) (Fly Spray)—DDT was used extensively as a fly spray during World War II, but flies gradually built up a resistance to it thus making it less effective. When used on milking cows and in dairy barns it was carried over to some extent into the milk. It is not now recommended for use on milking cows or in dairy barns.

Deacon, (in livestock)—A term used to designate a calf killed at, or very soon after birth. The skin of a very young or aborted calf. It must weigh less than eight pounds.

Deadborn—Stillborn.

Dead End—To the dairy processor this means a space in a sanitary pipe line which is more or less inaccessible to cleaning or to the free flow of milk or cream. This condition is usually created by curves or bends in the system or by the use of tees with one outlet plugged. It may also be caused by the formation of an air pocket in the pipe lines.

Dead Eyes—See Cheese Defects (Swiss).

Dead Whip—See Ice Cream Defects.

Dealer Pool—A plan used to operate a market-wide pool in the absence of a cooperative association or a Federal or State Control Board. All producers shipping to a dealer receive a uniform blended price for milk of the same fat content regardless of how the milk is used. The blended price depends on the amount of fluid milk.

Dealer's Spread—The difference between the price paid by the consumer for a quart of milk and the price paid to the producer.

Death Phase—That phase of the bacterial growth curve which has its inception in the first permanent decrease in the cell population and terminates when no living cell remains in the culture.

Decalcification—Removal of calcium carbonate or calcium ions from the soil by leaching.

Decayed Organic Matter—Plant or animal material that has passed gradually from a comparatively sound, perfect state into a stage of decay or decomposition.

Decumbent, In Agronomy—Reclining, prostrate, as plants, lying down with ends ascending.

Deep Setting Milk Separation—See Milk, Processing and Processing Equipment.

Defect—A departure from perfection or standards of perfection as deviation from standards set for dairy cattle, or from standards for dairy products, etc.
In England "fault" is used instead of "defect."

Defects in Dairy Products—See Butter, Cheese, Ice Cream, Dried and Evaporated Milk, and Milk and Cream Defects.

Deficiency Disease—An unhealthy condition of a plant or animal brought about by the lack of sufficient quantities of some element or substance required for its growth.

corresponding fold on any of various other animals as dogs or the wattles of certain birds

Dew Point—The temperature at which condensation of water vapor in the air takes place

Dextes Cattle—A breed of dairy cattle originating in southern Ireland. They are the smallest dairy breed—a mature cow weighing only about 700 lb. about 100 lb. less than the Kerry cattle to which they are kin. They are black in color sometimes with slight white markings on the under line. Individuals have produced as high as 8000 lb. of 4% milk but the average would probably be less than 5000 lb. of milk. These are not many in the United States.

Dextrin—A polysaccharide which is an intermediate hydrolytic product between starch and maltose. It is sometimes present in plants. Dextrins are produced from starch by the action of milk amylase.

Dextrose—A common monosaccharide sugar $C_6H_{12}O_6$. Also known as sucrose, corn sugar, glucose and cerelese. It is less soluble than cane or beet sugar and about 80% as sweet. It is used in ice cream, ices and sherbets in an amount not exceeding $\frac{1}{2}$ the total sugar, in order to lessen the tendency toward crystallization and thus improve the texture. It lowers the freezing point considerably. Commercially dextrose is manufactured by the hydmylsis of corn starch by means of heat and dilute acid.

Dextrose, Cerelese, Dextrose Hydrate & Corn Sugar, Use of in Ice Cream—See Ice Cream

D H I A.—The abbreviation of Dairy Herd Improvement Association. See Dairy Herd Improvement Association.

Diabetic Milk—A modified milk suggested by Ringer to supply protein nourishment for diabetic patients. It is a solution of casein in a mixture of salts approximating those present in ordinary milk. Diabetic milk has been found to have the following composition:

Water	90.50%	Milk sugar	0.12%
Fat	2.48%	Protein	2.41%
Levulose	4.41%	Ash	.45%

Perhaps not of importance since the discovery of insulin.

Diacetyl—A typical butter aroma compound derived from the oxidation of acetyl methyl carbinol (acetoin) by citrate fermenting microorganisms. In Cheddar cheese 0.16–3.5 mgms per gram of cheese.

Diagnosis—The determination of the nature of a disease from its signs or symptoms.

Diagonal Spray Condenses—See Jet or Spray Condenser.

Diaphoretics—Drugs used to promote the secretion of sweat such as camphor, ammonium acetate, pilocarpine, mustard and salicylates.

Diarrhea—An abnormally frequent discharge of more or less fecal matter from the bowel usually caused by certain bacteria. Such bacteria often gain access to raw milk. Pasteurization and other public health measures have brought about a marked decrease in this disease.

Diastase—An enzyme which splits starch into sugars. See Amylase.

Diatoms—Algae having a siliceous cell wall which persists as a skeleton after death. Any of the microscopic unicellular or colonial algae constituting the class *Bacillariae*. They occur abundantly in fresh and salt waters and are widely distributed in soils.

2,6-Dibromoquinone-chlorimide — $C_6H_3O_2NClBr$. Commonly known as BQC. It is an indicator which forms a blue color with phenol released from disodium phenyl phosphite in the common phosphatase test.

Dicalcium Phosphate—See Feeds and Feed Ing.

Di-chloramine—An organic chlorine compound in powder form insoluble in water and used to only a very small extent as a disinfectant in dairy work.

2,6-Dichlorophenolindophenol—An organic oxidizing dye usually used in determination of vitamin C or ascorbic acid in foods. This dye is blue in neutral and alkaline solutions and red in acid solution. In its reduced form it is colorless.

Dichydahystreptomycin—See Antibiotics.

Dicotyledons—A major division of the flowering plants including those having two seed leaves.

Dietert Solids-Fat Oven—An electrically heated forced draft circulation oven used for evaporating either and moisture in determining total solids and butterfat in dairy products made by H. W. Dietert Co. Detroit, Michigan.

Differential Media—Media used in bacteriology which permit the detection of acid-forming, proteolytic, lipolytic organisms, etc. A medium or media used to differentiate various types of organisms exhibiting different growth responses and cultural characteristics.

Diffusion—Chemistry and Physics—spreading or equalizing. The movement of the molecules of a substance from a region of their high concentration to one of lower concentration.

Digester Tankage—See Feeds and Feeding.

Digestible Energy—The gross energy less the energy lost in the feces. It corresponds to total digestible nutrients.

Digestible Nutrient—The portion of the feed which passes into solution during the digestive process, and is absorbed into the blood. In making up rations, it is this part of the feed that is considered and is usually expressed in terms of percentage.

Digestible Protein—See Protein, Digestible (available).

Digestibility—That quality of food which allows it to be chemically changed within the stomach and intestines so that it can be assimilated by the blood and furnish nutriment to the body.

Digestion—The process of converting nutritive material into a form which can be absorbed as food by the animal (or carnivorous plant) in which the digestion takes place. In the higher animals this process commences with the action of the saliva and continues, as the food passes through the alimentary canal, by the action of the various digestive juices.

Digestion Coefficient—See Coefficient of Digestibility.

Dihybrid—A hybrid whose parents differ in two characters.

Dika Butter—The product obtained from *Iringia gabonensis*, an African tree, is known by this name, while the *I. oliveri* of Asia gives a similar product called cay-cay butter. They have an edible value and are of some importance in the diolatec industry.

Dilatometer—An instrument for measuring or noting dilatation or expansion of a substance, especially of a fluid, by heat. It is sometimes used to measure the extent of freezing in ice cream and related products, also to measure the expansion of gases.

Dilution Bottle—A small, sterile, glass bottle used in diluting milk samples prior to plating for bacteriological examination.

Dip—To immerse an animal in an antiseptic or parasiticide solution for the cure of some disease or to kill some insect, as ticks or itch.

Diphtheria—An acute infectious disease of the mucous membrane of the throat or nose, particularly in children. The source of the infection is nearly always a human carrier of the disease. The causative organism, *Corynebacterium diphtheriae*, is usually spread by droplet infection from breathing, coughing, or sneezing. Although rather rare as a milk-borne disease, several epidemics have been traced to milk which has been infected with the bacillus by a human carrier.

Diplococci—Cocci occurring in pairs. See Cocci.

Diploid—In genetics, the condition in which both members of each chromosome pair are present; the chromosome number which usually and normally occurs in the somatic cell of a species, twice the gametic or haploid number.

Dipper Strainer Test—A method for determining sediment in milk. A long handled dipper with openings on the bottom and sides covered with a mesh wire strainer is placed at the bottom of a milk can, turned two-thirds of the way around the can and then turned quickly to face the current caused by the motion. The heavy sediment is carried into the strainer as the milk flows through and the floating sediment and flakes are caught as the dipper is brought upward. The collection of sediment and other material is then examined.

Dipping, (In Cheesemaking)—See Cheese.

Dipping Pail—See Cheese.

Direct Current—A current of electricity that flows at all times in the same direction.

Direct Delivery System—A system of buying milk or cream whereby the producer hauls the product directly to the creamery. Also known as direct shipper system.

Direct Expansion System—A refrigerating system in which the pipe coils in which the refrigerant is evaporated are placed directly in the space to be cooled. The heat necessary for the evaporation of the liquid

Definitions and Standards—Cheese and Cheese Products See Cheese

Deflation (Soil)—Removal of fine soil particles from soil by wind erosion

Defluorinated Rock Phosphate—See Feeds and Feeding

Defrosting—The removal of the shell or layer of ice from the coils in a refrigerated room in order to maintain proper refrigeration efficiency. In rooms under 32° F., defrosting is accomplished by several methods as follows:

- 1 The room is opened and allowed to warm up (the least effective method)

- 2 Brushing the coils with a stiff or wire bristled brush. This is not very effective as it may leave a thin layer of ice which gradually increases in thickness.

- 3 Scrubbing with hot water. A wet messy, disagreeable operation leaving much moisture in the room.

- 4 Passing hot liquid refrigerant through the coils. This requires extra valves and pipes in the installation but does not raise the temperature of the room much. The frost and ice are easily removed from the quickly heated coils before the ice melts.

- 5 Passing hot refrigerant vapor or gas through the coils. This is similar to the use of hot liquid refrigerant.

- 6 Using a brine drip or spray over the coils. A trough containing calcium chloride crystals is placed above the coil so that as the crystals absorb moisture the brine drips down over the coil to collect in a pan at the bottom. See Cooper System.

Degeneration—A progressive deterioration as a return to a simpler and less highly organized condition in the evolution of a group of animals or plants or of any of their parts or organs or in the development of an individual organism or part, retrogressive evolution.

Deglutition—The act of swallowing after the food has been thoroughly masticated and mixed with saliva, which is brought about by the action of the muscles of the throat and tongue forcing the food into the esophagus, or gullet, the tubelike passage which extends to the stomach.

Degrees—See Acidity, Density or specific gravity, Temperature.

Dehorning—The removal of horns from cattle. The best method of dehorning is to use caustic potash while the calf is under six months of age. As soon as the horn or

button can be felt under the skin, the moistened end of a potash stick is rubbed over it, care being taken that the potash touches no other part of the calf's face or the operator's hands to cause burns. Mature animals are dehorned with a saw, while animals from six to twelve months of age are usually dehorned with clippers. The electric iron is becoming popular for use when horns are in the budding stage.

Dehumidified—Process of taking moisture out of a substance.

Dehydrated Cheese, Dehydrating Cheese, Dehydroacetic Acid—See Cheese.

Dehydroascorbic Acid—This is the reversibly oxidized form of ascorbic acid or vitamin C. This form as well as the reduced form of ascorbic acid possesses biological activity for the prevention of scurvy.

7 Dehydrocholesterol—A sterol from which D₂ is formed by irradiation. It is the chief provitamin D present in milk, in animal fats and in animal skin. Vitamin D₂ is the chief vitamin D in cod liver oil.

Dehydrogenase—An enzyme which promotes the oxidation of various substances. Formerly called oxidase.

De-Lactosed Milk—A patented product resembling sodium caseinate and sometimes used as a source of lactose free serum solids in ice cream mix. Milk is coagulated with rennet the whey siphoned off and the curd then used in the mix. This product may also be used in certain instances when a sugar free milk product is desired.

Delft—See Cheese.

Delivered Price System—A method for purchasing cream at cream stations. The station operator contracts with the central creamery to sell all his purchases on a definite price basis. When butter prices are low and the overrun is therefore less valuable, the creamery usually pays to the station operator about 1 to 5 cents less per pound of butterfat than the market price of butter. When butter prices are high and the overrun therefore yields much greater profit, the central creamery often pays more for butterfat than the market price for butter.

Delshire Cream—See Milk and Cream.

Denaturation—A breaking down or modification of a substance or compound so that it no longer has its original qualities.

An irreversible chemical reaction of proteins involving uncoiling and unfolding of the specific configuration of the protein. The result is loss of solubility and increase in reactivity of various reactive groups in the protein. Denaturation can be brought about by heating or by the action of chemical denaturants such as urea, guanidine, and alcohol.

Denitrification—The biological reduction of nitrate or nitrite to gaseous nitrogen. The process results in the escape of nitrogen into the air and hence is undesirable in agriculture.

Denominator Multiple Counter—See Ice Cream.

Dent Corn—See Feeds and Feeding.

Density—Mass per unit volume. See Specific Gravity.

Dentate—Toothed margin, usually applied to divisions of a leaf.

Depletion Period—In vitamin or bio-assay work, this term is used to indicate the period during which experimental animals are on a diet which lacks the factor or factors which are under investigation. When the animals have reached a certain standard age, weight, and condition, they are ready to be placed on certain prescribed diets in accordance with the experiment.

Derbyshire Cheese—See Cheese.

Derris Root—A disinfectant derived from several species of plants known as derris, and particularly from the *derris elliptica*. Its active principle is a white crystalline material, rotenone, which is present to about 2% but varies widely in different plants of the genus derris. It is considered to be a contact insecticide. Derris root in the form of an ointment or as a soapy wash containing the powdered derris has been found effective against warbles on cattle.

Desaminocasein—A protein compound prepared by the action of nitrous acid on casein. In this process practically all the E-amino group of the lysine is removed from the casein and the percentages of several of the other amino acids are apparently somewhat reduced. This compound lacks the nutritional adequacy characteristic of casein, evidently due to the loss of the lysine amino acid.

Descaling—The process of removing scale. Quite often there are deposits of milk stone on dairy equipment. These can usually be removed by the application of a weak solution of hydrochloric or phosphoric acid. After the removal has been accomplished care should be taken to flush out with an alkaline washing powder or with water to prevent corrosion from the acid.

Desert Wheat—See Feeds and Feeding.

Desiccate—To dehydrate or dry. To remove the water content from a substance, as in the drying of milk to form milk powder.

Desiccated Milk—See Nonfat Dry Milk and Milk Powder.

Design or Ambient Temperature—The temperature of the air surrounding an object or equipment in a building. It is the basic temperature from which to compute heat loads in estimating the size of refrigeration installations. Usually the design temperature is taken as the average, for a year or a period of months or years, of the hottest conditions under which the unit or machine would have to work. Taking this average hot temperature as a basis together with other factors involved it is possible to calculate the right size of unit—neither too large nor too small to do the work required of it.

Detergent—Any mixture of chemical agents, usually alkaline, which contains softening agents as well as emulsifying, wetting or saponifying materials. In present acceptance a detergent usually does not contain true soap.

Devitrification—Act or process of changing from a vitreous to a crystalline condition.

Devon—A breed of dual-purpose cattle originated in Great Britain. The cows average about 1,000 lb. in weight and are hardy, strong, and active. In color they are generally a dark red with occasional white markings underneath. The cows are not persistent milkers and are not well adapted for market milk production in competition with other breeds. In production they average about 5000 lb. of 4% milk. Not many are found in the United States.

Devonshire Cream and Devonshire Cream Preparation—See Milk and Cream.

Devonshire Cream Cheese—See Cheese.

Dewlap—In the cow, the flap of loose skin running from the throat to the brisket. The

refrigerant is therefore absorbed directly from the air or whatever substance surrounds the coils. With this system however the work of refrigeration practically ceases with the stopping of the plant. Consequently it becomes necessary if constant low temperatures are to be maintained in the cold storage room to run the machine continuously.

Director of Markets—A State official appointed by the State Commissioner of Agriculture who directs and coordinates all marketing activities that come under the Department of Agriculture and also sees that such activities tie in with other Federal and State agencies of similar nature.

Dirt—Earth loose or packed soil.

Dirt Farmer—A farmer who himself works on the soil hence supposedly a practical farmer.

Dirt in Milk, Visible—See Sedimentation Test (by Pad Method).

Disaccharide—A sugar consisting of two monosaccharide units into which it can be split by hydrolysis. Lactose in milk is an example of a disaccharide.

Diseases Common, In Cattle—See Hand book article P 247.

Diseases, Human, Spread by Milk—Tuberculosis Diphtheria Typhoid Gastro-enteritis Undulant Fever Septic Sore Throat Scarlet Fever.

DISEASES OF CATTLE

(Dr Douglas N. Stern Extension Professor of Veterinary Science at the University of Massachusetts Amherst has carefully checked data on Diseases in Cattle.)

Abortifacient Infection—Commonly known as bovine infectious or contagious abortion. See Contagious Abortion.

Abortion—The expulsion of the fetus before the completion of pregnancy. Abortion in cattle may be caused by physical injury by deficient diet, by the presence of ergot in the diet or by the following *leptospirosis*, *vibriosis*, *intestinis trichomoniasis* and *brucellosis*.

A comparable disease in swine is due to *Brucella suis* and in goats and man *Brucella melitensis*. The *suis* and *melitensis* types are occasionally found in cattle and the abortion and *suis* types in man. *Brucella abortus* infection is commonly known as Brucellosis (Bang's disease).

Acetonemia—See Ketosis.

Actinomyces, (Lumpy Jaw)—A disease of cattle characterized by a swelling on the lower jaw, which may finally open and discharge pus. It is due to a fungus-like germ (*Actinomyces bovis*) which attacks the mucous membrane of the mouth. If neglected the fungous growth continues finally attacking the jaw bone. If treatment is given in the early stages complete recovery usually follows. Treatment consists of the removal of the tumor by a trained veterinarian. Actinomycosis of the tongue may be treated by daily drenching with 1½ 2½ drams of potassium iodide dissolved in water. However this treatment is not advisable for milking cows.

Afterbirth Retention of—The membranes enveloping the fetus are not expelled after calving and if not removed by a veterinarian within seventy-two hours after calving they decompose and may cause poisoning of the entire system. Decreased milk production is a result of this poisoning and often failure to breed.

Agalactia—A relatively uncommon disease of dairy cows characterized by suppression of the milk in the udder. This usually occurs as a result of unfavorable conditions at calving time. The teats should be examined for atresia or imperforation. If this is not the cause the animal should be given plenty of warm feed and water and the udder should be massaged regularly with belladonna ointment. Attempts should be made to milk the cow at regular intervals.

Alkali Disease, (Selenium Poisoning)—A disease of animals probably caused by eating plants growing in seleniferous soils in the alkali spots in the Great Plains areas. Selenium poisoning in milder form results in stunted growth, loss of hair, emaciation, decreased reproductive power, atrophy of liver, gastric damage and anemia. Later in chronic cases erosion of bones and hoofs and atrophy of the heart develop. Also called Blind Stagers.

Anemia—See Nutritional Anemia.

Anorexia—A loss of appetite.

Anthrax—A disease affecting herbivorous animals principally although hogs, dogs, cats and man occasionally become affected. Anthrax in herbivora occurs as an acute febrile affection characterized by depression, weakness, difficult respiration, bloody

diarrhea, and sometimes edematous swellings in certain regions of the body, particularly in the neck, sternum, flank, and lumbar regions. The mortality is very high. The causative organism, *Bacillus anthracis*, is a large, non-motile, aerobic sporulating rod. The organism forms long chains, particularly in artificial culture, is characterized by a mucin-like capsule, and is not very resistant. The anthrac spore, however, is very resistant. *Bacillus anthracis* may be present in the milk of affected cows. This disease in animals is largely controlled through immunization of susceptible animals with properly prepared biological products.

Aphthous Fever—See Foot and Mouth disease.

Atresia—Blind or imperforate teats existing in a heifer from birth and seldom if ever discovered until first freshening. Treatment is surgical, requiring the services of a veterinarian.

If no teat canal or milk duct is present, quarter will never be functional.

Autumn Mange—A skin affliction of domestic animals, caused by bites of chiggers, red bugs, mites, or ticks. It is characterized by papules and unallayable itchlog, and is most common in late summer and autumn.

Avitaminosis—Any of several diseases caused by a deficiency of vitamins in the diet, such as rickets, beri-beri and scurvy.

Bang's Disease, (Brucellosis, Contagious Abortion, Infectious Abortion)—A widespread disease causing abortion in dairy cattle. It is also identified with undulant fever in man. It is caused by a germ known as *Brucella abortus*, formerly *Bacillus abortus* (Bang). It is commonly introduced into healthy herds by addition of infected cows or infected pregnant heifers. May also be spread by infected sire, and may be carried on visitors' shoes from one farm to another, thus contaminating feed stuffs if walked on.

Symptoms may include any or all of the following: red-brown vaginal discharge, swollen udder or external genitals, low milk production, thickening of the milk, weak calves, retained afterbirth, sterility.

Prevention should be practiced by increasing the healthy herd only from its own offspring, or by adding animals only from abortion-free herds, preferably stock not yet of breeding age. Serologic tests should be made regularly to locate infected

animals before they endanger the whole herd, and newly introduced animals should be segregated until pregnancy has terminated normally or until two serologic tests indicate freedom from the disease, the first test being made two weeks after arrival of the animal, and the second, three to four weeks after the first.

The blood test to ascertain whether or not the animal is affected is called agglutination test. The milk may also be tested since in some animals the udder is affected and the germs are given off in the milk. Accurate test should be made only by an experienced person.

See Brucellosis and Milk Ring Test.

Big Neck—A descriptive term used to designate goiter in cattle. It appears in calves as a swelling of the neck at birth, caused by a swelling of iodine in the ration.

Blackleg—An infectious disease of cattle caused by a gas-forming germ. The disease often attacks the young cattle from the age of 6 months to 2 years. It causes lameness, dullness, loss of appetite, tumors or swellings about the shoulders and thighs, and finally prostration. Death occurs in a few hours. The germ can live in the soil. For this reason all infected cattle should be cremated in the field where they die, in order to avoid spread of the disease. Vaccination has been used with some success. Humans sometimes contract the disease.

Blind Staggers—See Alkali Disease.

Bloat—A disease of cattle characterized by the formation of an excessive amount of gas in the paunch. If relief is not given, the animal will die from suffocation. The trouble may be overcome by removing gas with a trocar or drenching with a formaline solution. If the trocar is used, select a point on the left side equi-distant from the last rib, the hip bone, and the transverse processes of the lumbar vertebrae.

Cattle most likely to bloat on pasture are those most often on legume pastures. As an aid in preventing bloat, the following precautions are suggested. During the first three or four days that the cows are on pasture in the spring, allow them the usual amount of silage hay and grain mixture in the morning before turning them to pasture. It is best not to start the pasturing season when the plants are wet from rain and dew. Leave them on pasture only about an hour for the first few days.

Bovine Infectious Abortion, (Bang's Disease)—See Bang's Disease.

Brain Disease—A weakening of the bones of animals. Animal rickets feed which contains much magnesium in proportion to calcium such as wheat bran and muddlings cause this disease when given in excessive amount for long periods. This disease is also known as miller's horse rickets.

Brucellosis—See Bang's Disease

Brucellosis Germ, Type #2—This form differs from the three classified *Brucella* species—*Br. abortus* (cattle), *Br. suis* (swine) and *Br. melitensis* (goats)—but definitely falls into the bovine or abortus species. While the known incidence is extremely limited, Type 2 produces a high abortion rate and causes visible udder disturbances indicating that it is highly pathogenic. Veterinary scientists do not know yet whether present vaccines will afford protection against the new form.

Dr. I. Forest Huddleson, bacteriologist at Michigan State College, reports the occurrence in his state of this new type of brucellosis organism.

Burtonail—A disease so named by dairy men because it was first observed in Burton Township, New Hampshire (now Albany, New Hampshire). See Cobalt.

Caked Udder—See Inflamed Udder

Calculus—See Milk Stones

Calf Diphtheria—A diphtheritic disease of calves caused by the organism *Actinomyces necrophorus*.

Cancer Eye (Carcinoma of the Eye)—A malignant tumor of the eye appearing first as a small red nipple which bleeds readily on touch. It ulcerates and usually has a fetid odor. If not operated on promptly it will destroy the eye and eventually the cow.

Cattle Plague—See Rinderpest

Cervicitis—Inflammation of the cervix or that portion of the reproductive organs which serves as a canal connecting the vagina with the uterus. It is a common disorder in the bovine animal and may seriously interfere with reproduction.

Clinical Mastitis—See Mastitis

Contagious Abortion—See Bang's Disease

Cottonseed Meal Poisoning—An affection of cattle caused by a toxic substance called gossypol which is present in cottonseed meal. When cautiously fed in limited quantities together with other foodstuffs cot-

tonseed meal is a valuable concentrate and can be safely consumed by adult sheep, cattle and horses, but young calves and swine are especially susceptible to the toxic substance and feeding allowances of from ¼ to ½ lb. per head have been observed to be fatal to calves. Gossypol appears to be a cumulative poison. Steers closely confined and heavily fed with cottonseed meal are affected after a period of approximately 3 months.

Cowpox—An acute virus-caused disease of cattle attacking the udder and teats and characterized by eruptions which are small at first but increase in size and finally form into a blister with raised margins and a depression in the center. If unbroken these blisters will dry up and fall off as scabs. The disease is spread from cow to cow by hands of milkers. Washing the udder with hyposulphite of soda solution is usually an effective treatment.

The disease is related to smallpox vaccination in man. Newly vaccinated persons may introduce it to cattle.

Deforming, Suppurating Wounds—Pus-filled wounds often formed after dehorning cattle with such wounds should be temporarily or permanently removed from the milking herd.

Dry rot—In animals, general ill health resulting from deranged metabolism. A form of gangrene.

Fibrosis—Induration or hardening of a cow's udder. A condition of scarred tissue caused by mastitis.

Fistulous Teat—An opening in the side of the teat resulting from a wound which has penetrated the milk duct causing annoying milk leakage. Treatment is surgical, consisting of scarifying the edges of the fistulous opening, bringing the lips together and suturing them into place to establish a closure of the aperture by healing. This operation should be performed only by one skilled in the practice.

Foot and Mouth Disease (Aphthous Fever)—An acute, very contagious febrile disease of cloven hoofed animals. It manifests itself especially by vesicular eruptions of the mucous membrane of the mouth, the skin between the toes of the feet and other parts. The cause is believed to be an ultramicroscopic organism which can be at least partially retained by filters of great density. The disease may attack other than cloven hoofed animals and is transmissible.

to man in infected milk, sometimes with fatal results. The disease causes great economic losses in the cattle industry. It may be combatted by slaughter, quarantine of the infected area, and by prophylactic measures.

Foot Rot—A common inflammation occurring between the toes and in the hoofs of sheep and cattle. There are two kinds—contagious and non-contagious. Foot Rot may be caused by an overgrowth of claws, irritation by stable filth, or by foreign substances such as cinders and stones wedged between the toes. The infectious form is caused by the organism *Actinomyces necrophorus*. The symptoms are limping and a swelling above and between the claws. To apply treatment, trim off the diseased tissue, wash the parts thoroughly and apply a 4% solution of copper sulfate to the exposed surfaces. Applications of some of the coal tar disinfectants are also effective. In early cases, the sulfanamides intravenously are useful. Radical surgery must often be resorted to.

Foul Foot—See Foot Rot.

Garget—See Mastitis.

Goiter—An enlargement of the thyroid gland found in calves in birth, caused by a lack of iodine in the ration of the dam of the calf. It is found in sections of the country where there is a lack of iodine in the feeds grown. Also called "big neck."

Hardening of Udder—A common udder trouble of dairy cattle. A result of structural changes in the udder tissue which often follow mastitis or inflammation of the udder. Treatment consists of hot bathing and rubbing of the udder twice daily after milking. After drying the udder thoroughly, apply an ointment of lard to which has been added a small amount of iodine. Avoid rich feeds and keep the cow in a laxative condition.

Hardware Disease—It may seem strange or careless, but every year great numbers of cattle—often the best in the herd—are lost through eating metal objects of one sort or another. The most dangerous of these are those with sharp points—staples, pieces of wire and nails. Cows swallow their food before it is thoroughly masticated which accounts for many of these foreign objects being swallowed. After being swallowed they are apt to move forward into the reticulum which often is only a short distance from the heart. If the object passes

through the wall of the reticulum it will likely result in peritonitis, causing the cow to drop in milk and lose her appetite. The sharp points of the metal may also penetrate the pericardium (the heart sac) after which there is no treatment. In the early stages foreign bodies, if located, often can be removed by surgery.

Hemorrhagic Septicemia (Shipping Fever)—This is a mixed bacterial infection often complicated by pneumonia. The symptoms include fever, chilling, coughing, discharge from the nose and eyes, weakness and diarrhea. Usually induced by the animal's lowered resistance to disease which in turn is brought on by hardships and hazards of shipping (neglect, exposure, mishandling and improper feeding).

Hoven—Another name for bloat. For description, see Bloat.

Impaction of Rumen—A distension of the paunch or rumen due to excessive amounts of dry fibrous feed. May be caused by lack of water, gorging on grain or straw, sudden feed changes or disease. Treatment: Remove cause and use laxatives.

Induration—See Hardening of Udder.

Infectious Abortion—See Bang's Disease and Brucellosis.

Infectious Catarrhal Conjunctivitis—See Pink Eye.

Inflamed Udder—A common udder ailment of good dairy cows that are in a high condition of flesh at calving. The udder becomes feverish and tender. Treatment consists of light feeding, laxative feeds, and milking 3 or 4 times daily, followed by thorough massaging of the udder with unsalted lard, camphorated oil or cottonseed oil. Inflammation of the udder accompanied by an infection is termed *mastitis*. Also called *caked udder*.

John's Disease—Chronic inflammation of the large intestine of cattle. Caused by an acid-fast organism, *Mycobacterium paratuberculosis*. There is a gradual loss of flesh and an intermittent diarrhea becoming bloody. Death may occur in from 1 month to two years.

Ketosis or Acetonemia—A nutritional disorder most commonly associated with long-continued feeding of roughages or feed low in sugar content. It is generally noticed near the end of a long winter feeding, and may be first recognized as a nervousness of

the cow often accompanied by digestive disturbance drop in milk production and loss of appetite. A check upon the ketones in the urine by a veterinarian with a change to a higher sugar content feed is advised.

Leptospirosis—A contagious disease of cattle caused by *Leptospira pomona*. It may result in abortions, lowered milk production and bloody urine with a high mortality in calves.

Lice—During the winter season especially cattle are often affected with lice. The most common types of lice affecting cattle are the blood-sucking blue louse and the biting red louse. The presence of lice may be suspected from the cows rubbing of the neck and shoulders on trees, posts, etc. and when the cow is badly infested the hair comes out in spots. Coal tar dips and compounds as well as derris powder may be used to kill the lice.

Lumpy Jaw—See Actinomycosis.

Malta Fever—A disease particularly affecting goats and consumers of goats' milk. In man the disease is characterized by a febrile attack incapacitating the individual and running its course in from 6 weeks to 1 year. The causative organism is *Brucella melitensis* var. *melitensis*. The organism is closely related to that causing abortion in cattle and undulant fever in man.

Mammitis—See Mastitis.

Mange—A skin affliction of cattle and other animals similar to scabies due to the presence in the skin of a burrowing mite. It is sometimes referred to as autumn mange.

Mastitis—A disease of the cow's udder due to an infection apparently caused in most cases by the organism *Streptococcus agalactiae* but may also be caused by the beta hemolytic streptococci of the *Streptococcus epidemicus* type said to be responsible for septic sore throat in man. It may also be caused by staphylococci and by *Bacillus pseudomonas* and other coliform bacilli. Other predisposing causes are too much protein in the ration, chilling of the udder by lying on cold floors, rough handling of the udder, too high vacuum in the milking machine, etc.

In most cases the first noticeable symptom is the presence in the milk of small clots or flakes no larger than a pinhead which become larger or stringy as the disease progresses and later the udder hardens or caks. Often the first indication of

caking is a small nodule or lump in the udder at the point where it is joined by the teat. Many dairymen depend upon the detection of the first small clots in the milk for a diagnosis and pass the first few strips of milk from each quarter through a piece of black cloth or strip cup.

There is a good possibility of controlling the spread of the disease by adopting a program of management and sanitation. See Brom Thymol Blue Test for Mastitis.

Milk Fever (Parturient Paresis)—A disease affecting cows that have recently calved. There is a loss of calcium from the blood and an increase in blood sugar. The animal appears dull, there is some muscular twitching and inability to support weight especially on hind limbs. A kink develops in the neck and complete unconsciousness usually sets in. Properly treated animals usually recover. To prevent the disease it is a good plan for a period of 10 days after calving never to remove all the milk.

The first successful treatment of the disease was inflation of the udder with air but if done by those not familiar with sanitation this treatment often results in ruined udders.

The calcium deficiency of this disease has been rectified by the intravenous use of a solution of calcium borogluconate supported in some instances by the subcutaneous injection of a sterile solution of magnesium sulfate and other agents including dextrose.

Do not milk the cow nor allow the calf to nurse while the cow is affected. Do not attempt to give medicine as it may choke the cow. Follow recovery with laxative feeds.

Milk Ring Test for Brucellosis in Dairy Cattle—Sometimes used as a screening test for determining whether or not there is brucellosis in the herd milk that is for determining the actual presence of the disease in the milking herd. It is not as yet used as a diagnostic test as it is not as sensitive as a blood test.

Dr. Huddleson makes the following suggestions regarding the test:

Making the Test—The "ring test" is performed by adding a measured amount (in drops) of stained bacterial cells (antigen) to approximately one cubic centimeter of whole milk in a small test tube; the sample is then mixed well and incubated for one hour. After mixing the milk is lightly colored the color being lighter than that of the antigen used (light blue-violet or

light red, depending on the color the bacteria are stained). In general, one of these two results will then be positive:

Positive Test—During the incubation period, a remarkable change takes place in the stained bacterial cells (antigen) previously distributed throughout the column of milk, providing that the sample has come from an infected cow, or represents pooled milk from a herd containing infected cows in lactation. The uniformly distributed cream and the stained bacterial cells become aggregated, and rise to the top of the column of milk. There they form a deeply colored ring (either blue-violet or red), which gives the test its name, leaving the milk-column white underneath.

Negative Test—If the milk sample examined comes from a non-infected cow or represents pooled milk from a herd free from brucellosis, there is little noticeable change in the color after the mixing in the test tube. The cream layer which forms on top of the milk column is either white, or slightly colored; the column of milk underneath retains the color it had at the start of the test.

The milk ring test is so sensitive that, with few exceptions, a sample of pooled milk will show a positive test even though it comes from a herd where there is only one infected milking animal among forty other non-infected milking animals. It follows that the greater the number of infected animals in lactation in a herd, the greater is the possibility of obtaining a positive test on a sample of pooled milk.

Advantages—1. Using the milk ring test, an entire milking herd can be examined as a unit at one time.

2. Milk samples for testing can be collected at a receiving center from each can of milk received from each farm.

3. Follow-up tests can be made on each herd at 30-day intervals.

4. Blood tests on animals in a herd can be delayed as long as composite milk from the herd shows a negative test; thus saving much expense and time in making blood tests on negative herds.

5. A larger number of herds can be examined in a short period of time.

Limitations—1. In its present state of development, the ring test may give a false reaction of "positive" (a) on milk from a small percentage of animals not actually infected; (b) on milk from a non-infected animal showing mastitis; (c) on colostrum from a non-infected animal.

2. Infection in a herd will not be de-

tected by milk ring tests, if only non-lactating animals are those infected.

3. Milk from a small percentage of infected animals will show a "negative" ring-test reaction.

4. The results of the milk ring test do not reveal the extent of infection, nor the number of infected animals in a herd.

5. It will still be necessary to use the blood test on individual animals in a herd to determine which animals are infected, and to determine the extent of the disease.

6. Results of the milk ring test do not as yet meet the requirements for legal sale of cattle.

Milk Sickness—This disease in man is the result of ingesting the poison *trematol* from consumption of milk, butter, cheese, or beef from cattle which have partaken of white snake root or the rayless goldenrod. The poison is cumulative, causing a restless, weak, exhausted, languid feeling during the early stages. Later abdominal pains develop with nausea, vomiting, constipation, thirst, loss of appetite, weak pulse, labored breathing, and subnormal temperature. The throat and intestinal tract apparently become paralyzed and in fatal cases death is often preceded by a prolonged coma.

The white snake root (*Eupatorium rugosum*) which contains the poison *trematol*, is abundant in fall pastures in parts of Ohio, Indiana, Illinois and North Carolina. The rayless goldenrod (*Aplopappus heterophyllus*) or Jimmy-weed of New Mexico and Arizona seems to produce the same disease. These poisonous plants produce Trembles in cattle.

Milk Stones, (Calculus)—Stones formed in the udder of the cow by coagulated casein or a concentration of lime salts. A frequent accompaniment of inflammation of the udder. Small concretions may often be removed by gentle massaging of the teat with belladonna ointment and the use of a sterile spring teat dilator. Large stones must be removed by a veterinarian by means of an incision in the side of the teat after the cow has dried up.

Mucosal Disease—This disease seems greatest during the winter and early spring. The death rate of cattle contracting the disease seems to be about 90%. Veterinarians familiar with the disease describe the symptoms as a sharp rise in temperature, up to 106° F. followed by a rapid drop to normal. There is a watery scouring, emaciation, erosion and ulceration of the nostrils, muscle, gums, tongue and oral cavity.

The American Veterinary Medical Association indicates that as yet there is no known remedy for this disease

Navel Ills—Painful inflammation of the region of the navel accompanied by discharge of pus in calves 2 or 3 days after birth often traceable to infection acquired at the time of birth or to dirty bedding

Nettle Rash—See Urticaria

Nutritional Anemia (Salt-lick)—A condition due to lack of salt iron copper cobalt and other minerals in the ration or pasture It has been found in a few places in Florida and the Western Prairies where soils and forage grown feeds are especially deficient in mineral content As a remedy the Florida Agricultural Experiment Station recommends feeding a mixture made up as follows 100 lb common salt 25 lb red oxide of iron 12 lb finely ground copper sulphate Place the mixture where the cattle have free access to it

Ophthalmia—A severe often purulent conjunctivitis—Inflammation of the deeper structure of the eye

Papilloma—A small red wartlike ulcerating tumor developing on the haw at the inner angle of the eyelids in cattle It should be removed before the eyeball becomes inflamed

Parturient Paresis—See Milk Fever

Pasteurellosis—Commonly known as shipping fever See Hemorrhagic Septicemia

Pearl Disease—Tuberculosis of the serous membranes The pulmonary form of TB frequently involves the pleura and hard fibrous pearl like tubercles containing caseous (cheesy) material found adhering to the thickened pleura hence the name Pearl Disease

Pink Eye (Specific Ophthalmia, Infectious Catarrhal Conjunctivitis)—A contagious inflammation of the eyes common in many herds Loss of eyesight may result if proper treatment is not given Treatment consists of placing the animal in a cool dark stable and washing the eyes twice daily with a strong solution of boric acid.

Pyriasis—A disease of domestic animals characterized by dry branny epithelial (surface skin layer) scales and due to digestive disturbances and alteration of the function of the sebaceous (oil) glands

Similar to Seborrhea

Pneumonia of Calves—Inflammation of lungs with difficult breathing and frequent coughing caused by exposure to a specific infection or a complication of diseases The first symptoms noted are dullness coughing and rapid shallow breathing The temperature is elevated the calf has a poor appetite a rough coat and loses flesh rapidly

Puerperal Fever—See Milk Fever

Pyometritis—A condition of the uterus in which there are chronic inflammatory changes of the uterine mucosae characterized by sacculation of one or both of the horns and flaccid muscular walls with little or no contractile power due to a loss of muscle tone The uterus is asymmetrical abdominal in position and one or both horns are partially filled or distended with pus

Retained Afterbirth—A disorder of cows frequently accompanying infectious abortion All the membranes which include the fetus and are attached to it are retained in the female genital tract

Rinderpest—A very fatal cattle disease in parts of Africa Asia Europe and the Philippines Not known in the U S An acute febrile (feverish) affection characterized by a diphtheritic inflammation of the mucous membranes of the alimentary tract Diarrhea often occurs Also known as Cattle Plague

Ringbone—There are two forms generally spoken of as high and low depending upon location It is best described as enlarged bony structure on fetlock and pastern of horses

Ringworm—A contagious skin disease of man and animals caused by fungi—eg *torulophyton spp* and *microsporum spp*

Circular areas of skin become denuded of hair and develop a grayish powdery or warty appearance Treatment is difficult and depends on particular organisms involved

Scours—A very common ailment of calves sometimes classed as diarrhea It is due to a digestive disturbance brought on by overfeeding irregular or dirty feeding or by unclean surroundings See White Scours Coccidiosis Vitamin A deficiency

Seborrhea—A disease in cattle characterized by dry skin which has lost its pliability It is a diseased condition of the sebaceous glands It may result in an excessive secretion which accumulates and forms scales or

crusts. Good grooming is important, and clean grain and hay should be given. The trouble disappears when animal is in pasture.

Selenium Poisoning—See Alkali Disease.

Sepsis—Poisoning caused by pathogenic bacteria.

Septic Sore Throat Mastitis—See Mastitis.

Septicemia—Blood poisoning caused by pathogenic microorganisms or their toxins in the circulating blood.

Shipping Fever—See Hemorrhagic Septicemia.

Specific Ophthalmia—See Pink Eye.

Staggers—See Trembles and Selenium poisoning.

Subclinical Mastitis—A form of mastitis (udder infection) in which the cow appears normal; the milk is normal in appearance, although there may be flakes detectable by means of the Strainer Test, using a black cloth or fine wire gauze. In aggravated cases the milk may appear watery. There is no toxemia, no marked rise in temperature, and the udder may not show any swelling or inflammation.

Suppression of Milk—See Agalactia.

Surfeit—See Urticaria.

Teats, Chapped—Roughness of the skin on the teats, which develops into sores, caused by exposure to cold winds, especially if teats have been wet in milking, or by damp bedding.

Teats, Sores & Scabs—Often caused by long fingernails, milking with wet hands or by the cow lying on a dirty floor. Some authorities have suggested treatment of saturated boric acid solution twice a day. Every other day paint with iodine.

Teats, Wounds—Wounds caused by tearing teats on wire fences or cows stepping on them.

The suggested treatment for wounds is to wash with boric acid solution and follow with a disinfectant dusting powder which can easily be applied with sifter top cans. A good disinfectant powder is made up about as follows: 1 part iodiform, 1 part tannic acid, 4 parts boric acid. If teat is badly torn it, of course, cannot be milked in which case a disinfected milk tube should be inserted. Hold in place by wrapping adhesive tape about it, using care not to have it too tight. Remove in about ten days. If badly torn or infected it is better to consult a veterinarian.

Tetany of Calves—Convulsions, spasms of muscles, stiffness of limbs and hypersensitivity, usually due to a calcium deficiency or a digestive disturbance.

Texas Fever—Cattle tick fever—an infectious disease of cattle caused by protozoan parasites (*piroplasma*) carried to cattle by ticks. Symptoms include high fever, destruction of blood corpuscles, jaundice, enlarged spleen, emaciation and death.

Trembles—A cattle disease due to the consumption of trematol-containing plants (white snakeroot or rayless goldenrod). Ordinarily these weeds are not consumed except in the late summer and fall when other vegetation is scarce. Symptoms are sluggishness, constipation, weakness, and loss of condition so that standing is difficult or impossible. Breathing is short, and the breath has a penetrating odor. Affected animals tremble, hence the common name "trembles." Humans, drinking the milk of affected animals contract the disease (known in humans as Milk Sickness), sometimes with fatal results.—See Milk Sickness.

Trichomoniasis—A genital disease of cattle caused by a protozoan (*Trichomonas foetus*) and characterized by temporary sterility, early abortions, and discharges from the uterus. Prevention hinges on a careful system of herd management.

Tuberculosis—A disease of man and animals affecting nearly every part of the body. It is caused by the acid-fast, rod shaped organism, *Mycobacterium tuberculosis*. The organism sets up a local infection, usually in lungs, at which point it produces characteristic nodules or tubercles. Four types of tuberculosis are recognized:

1. Mammalian tuberculosis.
2. Avian tuberculosis.
3. Tuberculosis of cold blooded animals.
4. Saprophytic strains, found in butter, grass, etc., no infection.

There is no great difference between human and bovine tuberculosis. A considerable number of cases of tuberculosis in man, particularly in children, have been found to be caused by bovine bacilli. Pasteurization of milk and frequent inspection of herds are necessary to combat this disease. See T. B. test.

Urticaria—(Nettle Rash or Surfeit)—An inflammatory condition of the skin characterized by flat swellings about as large as a bean, although they may sometimes attain the size of the hand. They have a clean or

sharply defined edge or border and appear suddenly sometimes overnight. The disease is due to errors in diet, too high feeding of fat stock, sudden changes of feed, indigestion and disorders of the liver. The eruptions may persist or they may suddenly disappear. There is no serious exudation unless it results from rubbing.

Vibriosis—An infectious disease of cattle caused by the *bacterium vibrio fetus*. It is a venereal disease characterized by early abortions and temporary sterility.

Warbles—Small grubs or worms that develop from eggs laid by the heel fly, sometimes called the warble fly. The eggs are laid on the legs of cattle in the spring. The animal, when licking itself, swallows the eggs. The eggs hatch in the digestive tract and the larvae (worms) find their way to the region of the back and loin. They appear as small lumps on the backs of the animals from which the grubs or worms may be squeezed out by hand. Warble infestation may be controlled largely by the destruction of the grubs before they drop to the ground. The animal's back may be treated with a wash consisting of 1 lb. of derris powder (containing 4 to 5% of rotenone), 4 oz. of white-flaked soap and sufficient water to make 1 gallon. This solution should be brushed into the hair with a stiff brush.

Warts—A skin growth in man and animals. Young animals are more often affected. Caused by a specific filterable virus. A wart vaccine is available which has been fairly successful.

White Scours—A serious infectious disease of suckling calves that is contracted by keeping them in unclean quarters. Caused by a germ entering through the navel at the time of birth or soon after. The calves become listless and weak. Their feces are fluid and fetid and sometimes frothy in appearance. In all cases the mortality rate is very high (80-90%). As a preventive the navel of the new-born calves should be treated with tincture of iodine and the maternity stall kept clean and well disinfected.

X Disease, (Hyperkeratosis)—This disease has been reported in various parts of the United States since 1917. There are many symptoms including thickened dry hard skin, red and swollen tongue and gums, loss of appetite and some salivation. It is often fatal and so far no cure for the disease is known.

Xerophthalmia—A disease of the conjunctiva leading to a lusterless condition of the eyeball and resulting in chronic inflammation. A deficiency of vitamin A predisposes to it.

Much the same as ophthalmia, an inflammation of the conjunctiva or of the eyeball.

Zoonosis—Any disease communicable from one animal to another or to man, a disease due to animal parasites such as rabies.

End of Diseases in Cattle

Disinfect—To free from pathogenic substances or organisms or to render them inert.

Disinfectants—Agents that have the power to destroy disease germs or other harmful microorganisms.

For disinfection purposes the most satisfactory because of their freedom from odors are the hypochlorites and the quaternary ammonium compounds. The hypochlorites are most satisfactory for utensils and the quaternary compounds are non-toxic for animals and humans and also tasteless and odorless.

Disinfectant Flavor—See Milk and Cream Defects.

Disinfecting Barns—Barns and stalls should be cleaned thoroughly with a brush and a hot lye solution or a hot solution of an alkali washing powder and a wetting agent. A spray with a coal tar or creosote disinfectant may be used for everything except the milking barn or the milk house. Chlorine compounds are a better disinfectant for these areas.

Disintegration—In soils the breakdown of mineral matter into smaller fragments by physical forces such as frost action.

Disk—A type of farm implement which depends upon revolving disks for the cutting and turning of the soil. Also used for pulverizing and smoothing a seedbed.

Dispensing Machines—See Vending Machines.

Disperse Medium—The medium or substance in which another substance (the disperse phase) is suspended or dissolved. Also called the Solvent in a colloidal solution.

Disperse Phase—In a colloidal system a suspension or an emulsion, the substance which is dispersed as oil in an oil-in-water emulsion.

Dispersion, (optical)—The difference between the index of refraction of any substance for any two wave lengths is a measure of the dispersion for these wave lengths, called the coefficient of dispersion.

Displacement—Displacement is a reaction in which an elementary substance displaces and sets free a constituent element from a compound.

Disqualification—A deformity or one or more serious defects in an animal or any product or an entire exhibit, which makes it unworthy of an award or score in a show.

Dissect—To divide into separate parts, to separate and expose the parts of, as an animal or plant, for examination and to show their structure and relations.

Dissolving Power, (of Dairy Washing Material)—A measure of their ability to dissolve proteins, as of milk.

Ditching in Cheese—See Cheese.

Diuretics—Drugs that stimulate the kidneys, increasing their excreting power. A good diuretic is nitrate of potash, or saltpeter.

Diversey Chlorine Testing Set—Apparatus used to test the strength of chlorine solutions, consisting of a small graduated cylinder, a bottle of orthotoluidin solution, a test tube and three prepared color tubes, arranged in a small box. Following are directions for its use: Fill the graduated cylinder with chlorine rinse or wash solution to the line R, then add tap or distilled water to the line marked W. To this add orthotoluidin solution to the line T. Shake the mixture and pour it into an empty test tube, and match the color of the solution with one of the three color tubes. After obtaining the closest match, read the side of the standard color tube, which shows the strength of the solution represented by that color and thus shows how much available chlorine the rinse or wash solution contains.

Diversion Dam—A structure for deflecting water from one stream to another.

Divider—A caliper or compass with two sharp metal points, used for measuring. In the Babcock test for determining the amount of fat in milk and cream, when test bottles are not provided with a regulator for adjusting the level of the fat column, the use of dividers in measuring the length of the column makes for greater accuracy.

D. N.—See Digestible Nutrients.

Doane Buckley Test—See Dairy Tests.

Dock—The solid parts of an animal's tail; the part of the tail left after clipping or cutting. Also refers to the process of clipping.

Doctrine of Descent—The theory that all animals and plants are direct descendants of previous animals and plants, as opposed to special creation.

Doddie, or Dobby—A cow or bull without horns.

Dogie—A motherless calf in a range herd; a cowboy term.

Dolomitic Limestones—A type of limestone composed of varying percentages of magnesium and calcium carbonates.

A mineral liming compound made from it and extensively used for correcting the acidity of soils is commonly known as Dolomite.

Domestic—Tame, as distinguished from wild; as domestic animals. That which belongs to or forms a part of the policy or the trade within one's own country as opposed to foreign.

Domiat—See Cheese.

Dominant—A genetic term applied to the member of an allelomorph pair which manifests an effect wholly or partly to the exclusion of the effect of the other allelomorph. In cattle, black coat color is dominant over red. Opposite of Recessive Character.

Dormant—A condition of life during which very little or no growth is exhibited. Unfavorable weather conditions generally bring on a dormant condition in plants such as during the winter months, and in some plants, during the hot, dry midsummer period.

Dorsal—Relating to the back or outer surface of an organ. Also to the upper surface of a blade of grass.

Dorset, (Dorset Blue, Blue Vinny, Blue Veiny)—See Cheese.

Dosage—Term used by medical men or veterinarians for the administration of medicine in doses.

Dough-Drying System—See Milk, Processing and Processing Equipment.

Drain—To provide outlet channels so that excess water can be removed by surface flow or by downward internal flow through the soil. To lose water by percolation.

Drain Tile—Concrete or pottery pipe for water outlets from soil.

Drainage—The removal of excess water under the force of gravity.

Draining Boards—Mats—Table—See Cheese.

Draw Knife—See Cheese.

Draw Rate Controller—A device that makes use of the fact that the load on the motor increases with the stiffness to which the ice cream is frozen. The load on the motor increases as the freezing progresses and reaches its peak at the point at which the refrigeration is shut off. The high point on the Draw Rate scale is that reading at which the ice cream should be frozen to obtain the uniform desired consistency and the point to which it should be whipped to obtain the desired overrun. Other batches are then frozen and whipped to the same Draw Rate readings thereby obtaining uniform freezing temperatures and overrun.

Drawing the Vat—See Cheese.

Drench—A medicinal potion poured down the throat of an animal.

Drenching—A common method of administering medicine to a cow by mixing the medicine with water elevating the head of the cow and giving the dose from a bottle. The bottle should have a long, strong neck to prevent crushing by cow's teeth.

Dressing—A general term for the application of any such material as manure, compost, fertilizer, lime, etc., spread over land to increase its fertility.

In cheesemaking a description of the method used in wrapping the cheese before aging or curing. See Cheese.

Dried Beet Pulp—See Feeds and Feeding.

Dried By-Products of Milk—See Handbook P. 176.

Dried Casein—See Casein Dried.

Dried Cream—See Milk and Cream.

Dried Grapefruit Refuse, Dried Lemon Pulp, Dried Orange Pulp—See Feeds and Feeding.

Dried Milk—See Milk Solids Dry.

Dried Milk Test—See Dairy Tests.

Dried Molasses, Beet Pulp—See Feeds and Feeding.

Dried Whey—See Whey Dried.

Drill—An implement used to plant seed in the ground in rows or drills.

Drumix, (Borden's)—Spray process dry ice cream mix. Contains all basic ingredients necessary for making ice cream.

Drop Savers—Devices for draining off and saving any milk or cream that remains in the cans before they are rinsed. Pans placed under any apparatus where milk or cream is apt to spill especially under filling machines. A surprising quantity is saved in this way.

"Dn Sweet"—See Corn Syrup Solids.

Drop—A term applied to the way in which animals give birth to their young as to drop a calf. Also the newly born animal.

Drop Method—See Pellet Method.

Drop Number—The number of drops given by a standard volume of liquid when flowing from a pipette or tube into air or another immiscible liquid (one which does not mix). The drop number serves as an approximate measure of the surface or the interfacial tension.

Drove—A large number of animals in one group moving or driving forward, as a drove of cattle being driven to new pastures or to market.

Druggists or Confectioner's Fold—See Cheese.

Drugs, Effect on Milk Yield—Some people feel that it is possible to increase fat percentage in cow's milk by feeding certain drugs. Exhaustive experiments have been run by several institutions to ascertain the effect of certain *galactagogues* (drugs). Experiments have been made feeding ginger, sodium bicarbonate and certain other drugs including epsom salts, pilocarpine and castor oil. In some cases there was a slight increase in the percentage of butterfat but also in most of them there was a slight decrease in the milk yield so that actually the net result was no increase in fat. The feeding of iodinated casein does increase slightly the percentage of fat in the milk of certain animals.

Drum Cooler, Drum-drying System, Drum Heater—See Milk, Processing and Processing Equipment.

Drum Swiss—See Cheese.

"Dry" Butter—See Butter.

Dry Cheese—See Cheese.

Dry Cow—A cow that is not producing milk. It is important that a cow be given a rest of six to eight weeks between lactations in order that she will have ample time to rest and store materials, such as calcium and phosphorus which she may need in greater quantities than she can consume during the stress of heavy production, and to give time to restore the udder to normal condition. Few cows need less than six weeks, and eight weeks rest is better.

Dry Cured Cheese—See Cheese.

Dry Farming—Production of crops without irrigation in regions of low or otherwise unfavorable rainfall, principally by tillage methods conserving soil moisture and harvesting crops in alternate years and by the use of drought-enduring crops.

Dry Ice or Solid Carbon Dioxide, (CO₂)—Dry ice is now extensively used in the dairy industry, particularly for refrigerating out-going packages of ice cream in trucks and for a variety of purposes. It is particularly popular because it refrigerates without forming water or any other liquid by-product. This refrigerant, after doing its work, passes off as carbon-dioxide gas.

Dry Lot Feeding—Feeding animals in an enclosure, away from pasture. This method of feeding is becoming popular in certain areas especially in Southern California and in Florida.

Dry Mash—See Feeds and Feeding.

Dry Matter in Cheese—See Cheese.

Dry Measure—A standard system of measuring volume for dry commodities such as grains, fruits, etc.; the common division is two pints to a quart, eight quarts to a peck and four pecks to a bushel.

Dry Pack Cabinet—One of the older type of ice cream cabinets in which the ice cream is set in a compartment around the outside of which salt and ice are packed. Now generally used only where electric cooling cabinets are not available.

Dry-Rendered Tankage, Dry-Rendering Method—See Feeds and Feeding.

Dry Rot—See Diseases in Cattle.

Dry Salting—Curing or preserving with common salt, Sodium chloride (NaCl), in the dry state. See Butter and Cheese.

Dry Splitting—See Cheese Defects (Swiss).

Dry Storage—A type of cold storage, especially for milk and cream, where refrigeration is by a current of cooled air. Also often referred to as plain unrefrigerated storage in a room.

Dryco, (Borden's)—Powdered low fat, high protein milk for infant feeding. First commercial milk product to be fortified with vitamin D by irradiation.

Drying—The process of eliminating moisture by evaporation as drying hay, lumber or clothes.

Drying Off—The act of putting a cow dry before she is due to freshen. This should be done from six weeks to two months before the cow is due to freshen. The best way to dry a cow with a healthy udder is to cut down the feed for several days and then to stop milking. The udder will swell up for several milkings but the milk will gradually be reabsorbed and the udder become dry and flabby.

Drying Rooms for Cheese—See Cheese.

Drying Up—The act of a cow going dry too long before her time of freshening. Some cows lack persistency and will dry up before they have milked for a full normal lactation period.

Dual-Purpose Cattle—A type of cattle bred for both milk and beef production in contrast to those called special-purpose which are bred primarily for either milk or beef. See Breeds of Dairy Cattle.

Ductless Glands—Glands without ducts whose secretions are poured directly into the blood or lymph. Among these glands are the thyroid, pituitary and adrenal. Their secretions are hormones. Also known as endocrine glands.

Due—In animals, expected time for young to arrive, as the due date for a cow to freshen.

Duel Cheese—See Cheese.

"Dulcine" (*p*-phenetyl-urea, or NH₂CONH C₆H₄OC₂H₅) is rarely used in ice cream even though it is supposed to be from 70 to 250 times as sweet as sucrose. Its use should be subject to supervision and restriction similar to that for saccharin.

Dull Glossy Eyes—See Cheese Defects (Swiss)

Dumping Up—See Butter

Dung—Manure the excrement of an animal To fertilize or dress with dung as to dung grass

Dunghull—A heap of dung A manure pile

Dunlop Cheese—See Cheese

Duo-Lizer, (Whitson's)—Combined stabilizer and emulsifier for ice cream and sherbet manufacture in powder form

Duplex Indicator Paper—A patented indicator paper which when dipped into milk gives a measure of the acidity In the duplex extra paper the wide strip in the middle called the indicator, is compared with the other strips If the milk is normal that is acidity not above 0.14% the indicator assumes the color of the two strips on either side of it If the acidity reaches 0.17% the indicator assumes the color of the second strip and if 0.21% the color of the third strip In duplex simple paper there are only two strips one on either side of the indicator strip This is used for fresh milk control as it will indicate only up to 0.14% acidity

Durham—Another name applied to the breed of cattle now known in this country as Shorthorns

Durophiles—Same as Thermophilic bacteria

Durra—See Feeds and Feeding

Dust Mulch—An induced loose, fine granular or powdery condition in the surface soil See Mulch

Dutch Belted—A breed of dairy cow originating in Holland The cattle are black with a broad white band around the body The cows weigh about 1100 to 1200 lb and they produce only a moderate amount of milk testing on the average about 3.4% Not many are found in the United States

Dutch Cattle—The Holstein Friesian breed and the Dutch Belted breed both of which originated in Holland

Dutch Cheese—See Cheese

Dwarf Essex Rape—See Feeds and Feeding

DX—An abbreviated form for the term direct expansion refrigerating systems

Dyes—See Coal Tar Food Colors

Dynamometer—An instrument for measuring draft of tillage implements and for measuring resistance of soil to penetration by tillage implements or to measure the muscular power of draft animals as horses It consists of a body in which a spring is set to be compressed or a weight to be sustained by the force applied This spring is connected with an automatic indicator or recording device to show in pounds the work performed

E

Ear Notches—Notches are cut in the ears of animals as a means of identification A notch represents a number depending on its location whether in the top bottom or end of the ear and also in which ear it is placed However many dairymen are not willing to disfigure their cattle in this way Some breeders of swine use this method

Ear Tab or Tag—An identification tab or tag clipped to the ear of an animal

Ear Tick—Any of several ticks which infest the ears of cattle horses sheep dogs etc especially the spinose ear tick common in the arid parts of the southern United States

Early Maturity—A term used to express the potentiality of an animal to reach a desired condition at an early age

Earth—The softer matter composing the earth as distinguished from the rock soil

Earth Nut—See Feeds and Feeding

Eberthella Typhosa—Another name for *Salmonella typhosa* the bacteria that causes typhoid fever A gram negative non-spore forming rod

Ebullition—Boiling

Ecology—That branch of biology which deals with the mutual relations of organisms with their environment

Eczeema—A skin disease which appears in many forms One particular form peculiar to dairy people is known as milker's eczeema which affects those who milk cows by hand

Edam Cheese, (Standards)—See Cheese

Edaphology—The scientific study of the relationships between soils and living things, including man's use of the land.

Effete—An animal no longer capable of producing young; exhausted of fertility; barren; sterile. Also applies to exhausted soil.

Egg—In biology, an ovum; the female germ cell of an animal or plant.

Egg Cheese—See Cheese.

Egg Flavor—See Ice Cream Defects.

Egg Powder—Desiccated egg in powder form. It is prepared usually by allowing beaten eggs to flow in a thin stream upon a wide block-tin belt, which moves slowly over revolving cylinders in such a way that the thin film of egg is heated carefully but never to a temperature above 120°F., lest the albumin be coagulated. This product is scraped from the belt and dried more completely in wire boxes, and finally packed in barrels for transportation. Many ice cream manufacturers use egg powder in their ice cream mixes.

Egg Powder Flavor—See Ice Cream Defects.

Egg Yolk Solids, (Dried)—See Ice Cream.

"Egoso"—A term meaning egg yolk solids—moisture-free egg yolk, and not to be confused with commercial dried egg yolk or egg yolk powder.

Egyptian Clover, Egyptian Wheat—See Feeds and Feeding.

Eiserner Trommel—See Milk, Processing and Processing Equipment.

Ejaculate—To eject; as ejecting fluids from the body.

Ejaculator—An electrical device with a heavy rubber or plastic probe, with ridges, and carrying an electric current through fine wires, used for obtaining semen for artificial insemination.

Ekenberg Process—See Milk, Processing and Processing Equipment.

Elastic Body—See Ice Cream Defects.

Elasticity—The property by virtue of which a body resists and recovers from deformation produced by force.

Elasticity of Cheese—See Cheese.

Elasticity of Demand—In the milk business this term refers to the effect that raising or lowering the price of milk has on the total amount of milk consumed. Usually when the price is lowered, the amount of milk consumed is increased and when the price is increased the amount consumed is decreased. This "elastic" demand for milk provides in part, the basis of changes in milk prices.

Electric Dehorner—An electric dehorner is an instrument heated by electricity designed for removing horns from young animals. It is similar to a high temperature soldering iron, with the iron being round and hollow at the end. It is heated to a temperature of 900 to 1000°F. and the hollow end is placed over the horn. In 5 to 10 seconds the cells at the base of the horn (or button) are destroyed and the horn will not develop.

Electric Power and Equipment—Nearly all modern dairy plants are now using electricity not only for lighting but for powering most of the machinery and to some extent for heating. It has many advantages for use in the dairy, principally because it is clean and generally sufficiently economical to warrant its use. In selecting motors and other electric equipment for the dairy, keep in mind the super-abundance of moisture in dairy plants which obviously calls for waterproof construction of all motors and this equipment must of course be built with all the essentials for safety of dairy employees working on wet floors. As far as possible, individual motors for each piece of equipment are recommended with push button control. All wires should be well insulated.

Electric Treatment in Pasteurizing Milk—See Milk, Processing and Processing Equipment.

Electro-ejaculation—The obtaining of semen by application of electrical current to the region of the reproductive organs. The device used is known as an ejaculator.

Electro-Pure Process—See Milk, Processing and Processing Equipment.

Electrocataphoresis—See Cataphoresis.

Electrolysis—The process of chemical decomposition due to action of an electric current. This action may take place when two metals of different electrical potentials are in contact with one another and are immersed (in the dairy) in milk or other fluid

dairy product Such a setup represents a typical galvanic cell or electric battery The action of the current is always accompanied by the corrosion of at least one of the metals in the equipment the less noble metal being the one attacked Hence if a tinned vat contains bare copper in contact with the tinned surface the tin will corrode

Electrolytes—Substances which when dissolved in certain solvents become more or less dissociated into electrically charged units or parts of the molecules called ions Strong acids and bases and their salts are the most satisfactory electrolytes Sodium chloride ordinary salt is the most important in determining conductivity For detailed information see a good book on Physics

Electrolytic Deacidification—A process for removing the acidity in milk by electrical currents It consists of passing milk through a vessel containing a series of electrodes from 5-10 mm apart through which a current is passed It is thought that the alkali chlorides are electrolyzed the free alkali thus formed neutralizing the acid and the halogen entering into protein combination This form of deacidifying is not practical with curdled milk for there is insufficient chloride present Also known as the Flact Process

Electromotive Force—Defined as that which causes a flow of current The electromotive force of a cell is measured by the maximum difference of potential between its plates The electromagnetic unit of potential difference is that against which one erg of work is done in the transfer of electromagnetic unit quantity

Electron—A very small negatively charged particle which is one of the fundamental units of matter Electrons appear to be uniform in mass and charge The charge of the electron is accepted as 4.80×10^{-10} absolute electrostatic unit

Electronic Sealing—See Cheese

Electronics—A very important word in present day language It is played up as a factor in almost every phase of manufacturing While radio frequency waves for producing heat inside a substance is being given much study it seems to have possibilities in drying paints and wood and for many other purposes but as yet it is not practical Future developments may find applications in dairy industry

Electrophoresis—See Cataphoresis

Electuary—A method of giving medicines by the mouth to animals It is simply a paste composed of honey syrup molasses, or other similar material into which the medicinal agent has been incorporated The material is smeared on the teeth or placed on the tongue

Elements—Substances which cannot be decomposed by the ordinary types of chemical change or made by chemical union

Elevator—An endless belt chain conveyor with scoops or buckets for raising material from one level to a higher one A building for elevating storing discharging and sometimes processing grain There are also motor driven bale elevators and conveyors especially constructed for elevating haled hay and straw, or bags of feed

Elisavetpölen Cheese—See Cheese

Emarginate—Having a portion or notch cut out usually at the extremity of the leaves of plants

Emasculate—To castrate to remove or make useless the reproductive organs of a male to geld

Embryo—In animals a young organism in the early stages of development In mammals the period from fertilization until life is noted usually about three months with animals having a nine month gestation period After this period and before birth the young is called a fetus

In plants a seed in the very early stages of development Parts of the seed within the seed coat which develop to form the future plant

Embryogenic—Pertaining to the development of the embryo

Embryology—The study of the development of an individual either animal or plant from the egg to the adult stage

Emery Flavor—See Milk and Cream Defects

Emetics—Substances that act upon the stomach causing emesis or vomiting They are useful for humans dogs cats and pigs but should not be given to horses or cattle

Emuliano, Emmentaler Cheese—See Cheese

Emmer—See Feeds and Feeding

Emulsifier—See Milk Processing and Processing Equipment

Emulsifiers, (Mixture of mono- and di-glycerides)—See Ice Cream and Emulsifying Agents.

Emulsify—To convert into an emulsion. See Emulsion.

Emulsifying Agents or Salts—See Cheese.

Emulsifying Power, (of Dairy Washing Material)—The ability to form an emulsion with fat and remove it from the surface.

Emulsion—A suspension of particles of liquid within another liquid. Milk and cream represent emulsions, the fat globules being suspended in the milk plasma. See Colloid.

Emulsoid—A hydrophylic or lyophilic colloid; that is, one in which the suspended particles show a great affinity for water. Lactalbumin, globulin, gelatin, agar-agar, and gums are typical emulsoids. In emulsoids the affinity for water is sufficient to keep the particles in suspension even when the electric charges are neutralized. Emulsoids are higher in viscosity than suspensions. In this respect, casein is classed as an emulsoid.

Emulsor—See Emulsifier.

Endemic—Prevalent in or confined to a certain territory—as a disease of animals or plants.

Endocrine Gland—A ductless gland so-called because its secretion is not carried in a duct or vessel but is eliminated directly into the blood or lymph. This type of gland secretes hormones, commonly known as chemical messengers of the blood, and explains many of the physiological phenomena. The endocrine glands are: Adrenals, ovaries, pancreas, parathyroid, pineal, pituitary, testes and thyroid.

Endoenzyme, (Intracellular Enzyme)—An enzyme which is found in cells. It is not given off by cells. It may be obtained only after the cell is ruptured as in the preparation of zymase by the Buchner pressure method. The endoenzymes may also be liberated during autolysis (the process of self-digestion) after the cell dies.

Endosperm—Nutritive tissue around the embryo of many seeds. In grasses the endosperm persists and forms the major storage organ of the seed, containing large quantities of starch.

Endospore—A spore developed within the cell wall.

Endotoxin—A poisonous substance produced by bacteria but not liberated until the cell is dead.

Enduro—See Stainless Steel.

Energy—That which gives rise to changes in the properties of bodies and to the power to produce such changes. Since all forms of energy are convertible into heat, energy changes of body processes are usually expressed in heat units (calories). The capability of doing work.

Potential energy is energy due to position of one body with respect to another or to the relative parts of the same body.

Kinetic energy is energy due to motion.

Energy (Gross)—The total energy furnished in a feed. It is equivalent to the amount of energy manifested as heat when the feed is completely oxidized. It can be determined by burning the feed in some form of calorimeter, and is expressed as calories.

Energy, (Metabolizable)—That part of the gross energy which is not carried off in the urine, feces or gases. It is the energy that is capable of transformation in the body. Other terms employed or synonymous for metabolizable energy are fuel value, available energy and nutritive energy.

Energy, (Net)—The metabolizable energy minus the energy needed for the work of digestion is called the net energy. It is the energy that an animal has left with which it may do work, put on fat, or produce milk.

Energy, (Nutritive)—Animals derive energy from proteins, fats and carbohydrates in their feed. These are converted within the animal body to urea and extractives, carbon dioxide and water. The quantities of energy given out by these chemical changes undergone by the food within the body can be calculated and it can be predicted just how much energy a given quantity of certain foods will yield to the animal body. All forms of energy can be readily converted to heat, therefore energy is usually measured in terms of heat. This unit is called Calorie (large), which is defined as the quantity of heat required to raise the temperature of a kilogram of water from 15°C. to 16°C. (59°F. - 60.8°F.).

Energy Source—The source from which an organism derives the energy for metabolic activities, e.g., sunlight, sulfur, cellulose, hydrogen, etc.

Energy, (Total)—See Energy (Gross).

Energy Values—See Calorie

Engadine, English Dairy Cheese—See Cheese

English Rye-Grass—See Feeds and Feeding

Enrich—To make rich or richer as soil with fertilizer or manure

Enrichment Culture—A technique in which environmental including nutritional conditions are controlled to favor the development of a specific organism or group of organisms

Ensilage—A process for preserving green fodder for cattle. The fodder is stored and tightly packed in a silo. The purpose of the process is to exclude air as far as practicable thus permitting a limited fermentation during which much of the protein is transformed into amino-acids. The fodder preserved in a silo also is spoken of as ensilage or silage

Ensiling—Preparing and storing fodder in a silo

Enteric Fever—Indicating a fever of the alimentary canal having reference to intestinal

Enterokinase—An enzyme secreted by the intestinal walls which activates trypsin. See Trypsin

Entire—Undivided as applied to a leaf sheath or margin

Entomology—The study of insects and their habits

Environment—The sum total of the external influences affecting the life and development of an organism

Enzymatic Improvers—See Ice Cream

Enzymes—Biochemical catalysts formed by living tissue but capable of action outside of the tissue. Enzymes are proteins and are inactivated by heat treatment. They are organic compounds of as yet unknown chemical structure but it is known they have the power to change other organic compounds without themselves being changed. Enzymes do not cause any chemical change. They seem to be agents which control the rate of chemical reactions. Their most important reaction seems to be that they control hydrolysis. It seems that some enzymes control oxidation while others control reduction. Experimental evidence indicates that some of them work best in an alkali medium while others do their best work in an acid medium. There are specific

enzymes for proteins for carbohydrates and still others for fats, all essential to most of the functions of the living organism

There are many groups of digestive enzymes which are more fully described in books on nutrition. The principal ones generally regarded as present in milk are Aldehydease Amylase (Diastase) Catalase Galactase Lipase Peroxidase and Phosphatase. Lactase and Salolase are thought by some to be present in average milk. Lipase and Phosphatase are considered the most important enzymes from a market milk point of view

Enzymes of Cheese—See Cheese

E.O.D.—Every other day delivery of milk

Epidemic—Affecting many in a community at one time. Spreading widely or generally prevailing as a disease. This term is used in speaking of humans only. Epizootic is the comparable term used in animal diseases. Epornitic or epornithic in birds

Epidermis—The outer layer of skin of a plant or animal

Epistasis—In genetics masking effect, similar to dominance except that it occurs between different factors instead of between two members of the allelic pair as is the case with dominance. Ex. Albinism in rats

Epistatic—As applied to genetics that condition in which one factor prevents a factor other than its allelomorph from exhibiting its normal effect on the development of the individual

Epithelial—A type of body cell normally present in milk. Epithelial cells are derived from the outer surface of the secreting tissues of the udder

Epoisse—See Cheese

Equal Parent Index—An estimate of the value of a bull as a breeding animal calculated on the basis of the production of his daughters and their dams. It is subject to very great errors due to production level of the dams, environmental differences between dams and daughters and selection of data

The Equal Parent Index equals twice the average of the daughters standardized records for milk and test minus the average of the dams standardized records

Equilibration Period—That period after glycerolation until freezing, during which the glycerol is presumably coming to equilibrium inside and outside the sperm cell. Used by Polge *et al.* Term used in preparation of semen to be frozen.

Equilibrium, (Chemical)—A state of affairs in which a chemical reaction and its reverse reaction are taking place at equal velocities so that the concentrations of reacting substances remain constant.

Equilibrium, (Constant)—The product of the concentrations (or activities) of the substances produced at equilibrium in a chemical reaction divided by the product of concentrations of the reacting substances, each concentration raised to that power which is the coefficient of the substance in the chemical equation.

Equipment for Condensing and Evaporating—See Vacuum Pan (Rapid Circulation).

Equivalents of a Quart of Milk—A term used by nutritionists in explaining the amounts of other forms of milk products which equal in nutritive value one quart of whole fresh milk, and which may be substituted in part for the recommended quart of milk for every child and pint of milk for each adult per day.

Some equivalents are: 1 pint undiluted evaporated milk = 1 quart whole fluid milk; $\frac{1}{4}$ pound dry milk = 1 quart whole fluid milk; $\frac{1}{3}$ pound of cheese = 1 quart whole fluid milk.

Erepsin—The enzyme in the intestinal juice which acts on the proteoses and the peptones which have been broken down from the proteins by the pepsin of the stomach and the trypsin of the pancreas and breaks them down into simple amino acids. It cannot act on protein that has not already been broken down to the proteoses and peptones.

Erg—The unit of work in the centimeter-gram-second system of physical units, or the work done by the force of one dyne moving through one centimeter.

Ergosterol—A sterol first isolated from ergot—hence its name. It is the provitamin D found in yeast. When irradiated it is called Calciferol. This is the form of vitamin D present in the commercial product Viosterol, a concentrated form of vitamin D.

Ergot—A fungus often found in common feeds. Ergot acts on the nervous system of

the animal, depressing heart action and thereby restricting the blood circulation. In pregnant animals, it often causes abortion. Affected animals have colicky pains and the circulation in the ears, the tip of the tail, and the feet may be stopped to such a degree that gangrene sets in and the diseased parts slough off.

Eriwani Cheese—See Cheese.

Erlenmeyer Flask—A glass flask of the conical type, having a flat bottom of a diameter equal to from $\frac{1}{2}$ to $\frac{3}{4}$ of its height, and with side surface tapering smoothly from the base to the bottom of the neck, which is short, narrow, and straight sided. These flasks have the advantage of being more easily washed out than round bottom flasks, but they are somewhat more liable to crack on heating. Used in food laboratories.

Erode—To take away exposed soil by wind, water, or other agents.

Erodible—Susceptible to erosion. A soil, for example, that is quite susceptible to erosion is referred to as erodible, while one that is resistant to erosion is said to be relatively non-erodible.

Erosion—The general process of the wearing away of soil or rock at the earth's surface by natural processes; as heat, cold, wind, water, etc. Accelerated erosion is more rapid than natural normal or geological erosion, as a result of improper cultivation or deforestation by man or immoderate use by animals.

Erosion Pavement—A layer of coarse fragments, as gravel or stones, on the surface of the ground, remaining after the removal of fine particles by erosion.

Ervy Cheese—See Cheese.

Escherichia—*Aerobacter*—Two bacterial genera which make up the major portion of the coliform group of bacteria. Aerobic, gram negative, non-spore forming bacteria which produce acid and gas from lactose fermentation. Dirt such as manure, bedding and soil that falls from cow's flank, belly or tail abound in these bacteria unless cow is properly washed or brushed before milking.

Escherichia Coli—The type species of the *Escherichia* genus. It consists of small gram negative, motile or non-motile, non-spore-forming rods fermenting lactose with production of acid and gas. They do not pro-

duce acetyl methyl carbinol from glucose are able to reverse the action in a 5% glucose phosphate peptone solution very slowly or not at all and are generally unable to utilize uric acid as the sole source of nitrogen. Pathogenicity (disease producing ability) of the organism is slight except when it penetrates to parts of the body other than the alimentary tract. The species is primarily of fecal origin and therefore, by its presence indicates sewage pollution in water. Its presence in milk is indicative of dirty milking conditions and improper handling after pasteurization.

Escutcheon—An area just above the rear part of the udder of many quadrupeds distinct in certain domestic cattle where it is called also milk shield or milk mirror. The area extends outward and upward to the flanks distinguished by the direction of the hair which turns upwards rather than downwards.

Esophageal Groove—In a cow a semi-canal providing passage for feeds from the esophagus in the 1st and 2nd stomach compartments. Also functions in separating the boluses from the rumen contents. It is 6-8 inches in length and passes downward in the right wall of the reticulum. The bottom of the ventral (lower) portion has papillae very small pimple like structures similar to those on the surface of the tongue.

Essential Elements—The chemical elements necessary for plant growth.

Essential Oil Flavors—See Milk and Cream Defects.

Esterase—An enzyme capable of catalyzing the hydrolysis of esters. Examples of esterases in milk are lipases and phosphatases.

Estrogenic Hormones, Estrogen or Oestrogen—The hormones which stimulate the lacteal or duct system in heifers or other females of the mammalian species. They are secreted by the ovaries and are responsible for the heat period after the animal has reached sexual maturity. They are essential to normal development of secondary sex characteristics of the female such as development of the mammary system. They include estradiol, estrone, estrin, equilin and equilin and are chemically described as an unsaturated hydroxyketone $C_{18}H_{26}(OH)(CO)$ closely related to cholesterol.

Estrone—See Theelin and Estrogenic Hormones.

Estrus, also Estrum—The period of heat or sexual excitement in the female. A follicle ripens in the ovary and the other reproductive organs prepare to receive the ovum. In cattle this period is characterized by bellowing and riding of and being ridden by other animals and lasts on the average of 16 hours.

Estrus Cycle—The period from one heat period or estrus until the next. In the cow this averages about 21 days but varies from 16 to 28. Ovulation occurs on the average about 14 hours after the end of heat.

Ether Extract—The fatty substance of foods and feedstuff. It is termed ether extract because ether may be used to extract the fat from various substances.

Eucasin—A caseinate of ammonium a soluble powder somewhat similar to nutritive. See Nutrose.

Euglobulin—A protein which exhibits all of the characteristics of a globulin—i.e. precipitates at 50% saturation with ammonium sulfate and is not soluble in pure water. Milk contains a euglobulin in the amount of about 0.5 gms per liter.

Eutectic Point—See Cryohydric Point.

Evaporated Cream, Evaporated Milk, (Maternized)—See Milk Processing and Processing Equipment.

Evaporated Milk Test—See Dairy Tests.

Evaporated Skim Milk, (Composition of)—See Milk Processing and Processing Equipment.

Evaporating Coils—See Expansion Coils.

Evaporation—The loss of water into the air as water vapor. Changing of liquid into gas.

Evaporator—See Milk Processing and Processing Equipment.

Evaporator Condenser—An ammonia coil wet with water by spray or gravity and provided with a fan to accelerate the evaporation of water.

Evening Milk—This milk is usually higher in fat than morning milk, but lower in quantity due to the shorter interval between morning and evening milking.

Eviscerate—To disembowel or gut an animal.

Exchange—An organized market place conducted according to established rules by qualified members with severe penalties for infraction of rules.

Exchange Capacity—See Cation Exchange Capacity.

Exciting Causes of Disease—Those causes that act directly or immediately to bring about the disease. In a case of tuberculosis, the germs, *tubercle bacilli*, are the exciting cause and, on gaining entrance to the body, set up tuberculosis. Other factors may also act as exciting causes, such as heat or cold, improper feed or polluted water, lack of feed or overfeeding, overexertion, and such living organisms as insects, worms, and germs.

Excrement—Waste matter discharged from the body, especially from the alimentary canal.

Excrescence—A disfiguring, abnormal or superfluous outgrowth.

Excrete—To eliminate or discharge harmful waste, or superfluous material from blood or tissues of man or animals, or from the active protoplasm of plants.

Excretion—Act or process of eliminating waste products from the body of an organism.

Exercise Lot—An enclosure, usually out of doors and larger than that ordinarily provided in a barn, where an animal may move about.

Exhaust—The escape of the working fluid or gases from an engine cylinder at the end of the working stroke; also, the period over which this occurs. To deprive of fertility, as to deplete the soil.

Exhaust Steam—Steam discharged from an engine or machine after surrendering a portion of its energy.

Exhaust Stroke—Piston stroke which forces out of the engine the gaseous products of combustion; fourth stroke in a four cycle engine and the latter part of the power or expansion stroke in a two cycle engine. If assisted by a blast of air from a scavenge pump or blower, it is called the scavenge stroke.

Exhibition—A public display of objects; as, an Agricultural Exhibition is a showing of agricultural products.

Exhibitor's Herd—A group classification of dairy cattle for the show ring. It consists of one bull, 2 years old or over; one cow, 3 years old or over; one heifer, 2 and under 3 years old; one yearling heifer, and one heifer under one year.

Exocrine Gland—See Gland.

Exoenzyme, (Extracellular Enzyme)—A free, secreted enzyme which is independent of the cell which secretes it.

Exotoxin—A poisonous material excreted by bacteria into food or culture. Such food may be dangerous even after bacteria have been killed. See Book on Food Poisoning.

Expansion Coils, (Evaporating Coils or Cooling Coils)—In mechanical refrigerating systems, a series of pipe coils in which the liquid refrigerant vaporizes under low pressure after passing through the expansion valve. The expanded gas in these coils takes up heat from the surrounding air in the case of the direct expansion system or from the brine in the case of the brine system. See Refrigeration.

Expansion in Milk—Milk expands and contracts approximately the same as water. The expansion coefficient is approximately one part per thousand for every 10° F. rise in temperature and contracts the same on cooling.

Expansion Tank—See Milk Trap.

Expansion Valve—The valve between the receiver and expansion coils in a mechanical refrigerating system. The liquid refrigerant passes through the small opening in the valve under high pressure into the expansion coils where the pressure is low, bringing about the vaporization of the refrigerant with the resulting absorption of heat.

Expectorants—Substances which modify the secretions of the membranes of the throat and bronchial tubes. They may be *sedative* (ipecac, apomorphine, ammonium chloride), *irritant* (terpine hydrate, creosote, benzoates), or *soothing* (opium, codein, chloroform).

Experiment Station, (U. S.)—A place where research work in all phases of agriculture is carried on continuously. It is usually in connection with the State College of Agriculture, and there is at least one in each of the 48 states of the United States. Some states have several.

Export Cheese—See Cheese.

Excitator—See Elenberg Process.

Extension Service, (U. S.)—A Federal Department that makes available through grants-in-aid and other means, in coopera-

tion with the state agricultural colleges the results of department research and service for practical farm applications to coordinate extension activities of the department and the state agricultural colleges

External Conduction—This term refers to the transfer of heat between two separate bodies placed in direct contact with each other

External Conical Cooler—See Milk Processing and Processing Equipment

External Latent Heat—This term as applied to the manufacture of evaporated milk represents the thermal equivalent of the energy expended by the vapors in making room for themselves against the pressure of vapors and air over the boiling milk.

External Tubular Cooler—See Milk Processing and Processing Equipment

Extracellular Enzyme—An enzyme which acts outside of a living cell See Exoenzyme

Extraneous Matter in Cheese, Test for—See Dairy Tests

Exudate in Cheesemaking—See Cheese

Eye Formation in Swiss Cheese, Eye forming Cultures in Cheese, Eyes in Cheese—See Cheese

Eye Test (for T.B.)—See Ophthalmic Test (for T.B.)

E-Z Cheez, (Whitsons)—See Cheese

F

Face—The front part of the head of an animal including the eyes cheeks nose mouth etc.

Factor—As applied to genetics a unit of inheritance occupying a definite locus on one or both members of a definite chromosome pair the presence of which is responsible for the development of a certain character or modification of a character of the individual which possesses that genotype a determiner or gene

Factory Butter—See Butter

Factory Score Card—See Cheese

Facultative Anaerobes—Microorganisms which grow either in the presence of a small amount of free oxygen or in the absence of it

Failure to Whip—See Milk and Cream Defects

Fair—A competitive exhibition of animals wares crops or their by products not primarily for the purpose of making sales and usually with premiums for excellence

Faking—Has many meanings but in live stock judging it is an attempt on the part of an exhibitor to deceive the judge

Falling Ball Method—See Dairy Tests

Fallopian Tubes—The pair of fine ducts in the genital tract of the female animal which lead to the ovaries and convey the ova or egg to the uterus Analogous to the vas deferens of the male

Fallow—The practice of plowing but not sowing land for the alternate seasons the object being to conserve moisture or plant nutrients

Family—A group of closely related individuals animals or plants tracing descent from certain ancestors as in the term cow family

Fancy—In Ice Cream making the decorative shapes and forms in which the product is molded and the designs used in making it especially pleasing to the eye as well as to the taste See Ice Cream In Animal Husbandry to breed for certain special points that are highly prized by breeders

Fancy bred—Having a highly desirable pedigree as fancy bred cattle

Fancy Centers with the Continuous Freezer—See Fancy Molded Ice Creams Novelties and Specials

Fancy Molded Ice Cream—See Ice Cream

Fanning Mill—A machine for separating chaff from grain

Farm—Any tract of land devoted to agricultural pursuits under the management of a tenant or owner land devoted to the raising of crops domesticated animals or other animals as a dairy farm

Farm Bulk Tank—A refrigerated tank used on the farm for raw milk storage The sizes vary from 60 gallons upward. Used to replace the 10 gallon can system of holding milk.

Farm Bureau—One of many national, state or local associations of farmers, united into a national federation to improve conditions of farming in the United States and to encourage cooperation.

Farm Butter—See Butter.

Farm Cheese—See Cheese.

Farm Credit Administration, (FCA)—A United States government organization established by executive order, March 27, 1933, to provide a system for furnishing Federal credit to farmers.

Farmer—One who farms, or spends most of his time managing or conducting a farm; a tiller of the soil.

Farmerette—A girl or woman who farms or works on a farm; a farmeress.

Farm Hand—A farm laborer, especially a hired laborer.

Farm House—The main dwelling house on a farm.

Farmhouse Cheddar—See Cheese.

Farm Loan Bank—A United States Federal Land Bank, loosely but incorrectly so called.

Farm Management—The phase of agricultural economics dealing with the management of a farm.

Farm Manure—See Manure, Farm.

Farm Security Administration, (FSA)—A government agency created by the Secretary of Agriculture, September 1, 1937 to carry out (through county committees) authorized farm-tenant aid and rural rehabilitation programs, especially as loans to farm tenants, share-croppers, and farm laborers, to enable them to become farm owners.

Farmyard—The yard or enclosure attached to a barn, or the space at or near the farm buildings.

Farrington Acid Test—See Dairy Tests.

Fascere—See Cheese.

Fast Curd—See Cheese.

Fast Cured—See Cheese.

Fat—A greasy compound found in animal and vegetable substances. Fats are esters of glycerol and fatty acids and are generally solid at room temperature, in contrast to oils which are liquids. Milk fat is not a single fat, but is a mixture of mixed trigly-

cerides. It contains significant amounts of at least 16 different fatty acids ranging from four to twenty carbon atoms. The condition of fatness; inclined to be fat. Also applies to butterfat of milk.

Fat Determination in Cheese, (Babcock)—See Dairy Tests.

Fat-free Milk—Milk from which most of the fat has been removed. See Milk.

Fat Globules—In milk, minute spherical particles of butterfat found suspended in the milk plasma. These globules range in size from 0.1 to 20 microns in diameter, but generally average from 3 to 4 microns in milk. They vary in size with breeds, individuals and period of lactation; one drop of milk may contain as many as one hundred million fat globules.

Fat Globule "Membrane"—A name applied to the stabilizing materials adsorbed on the surface of the fat globules of milk. These materials consist largely of proteins and phospholipides.

Fat in Milk—See Milk Fat.

Fat Leakage—See Cheese.

Fat Plus Two—A system of payment for milk. The value 2 is added to the fat test of the milk. This system of payment recognizes the value of the other solids in milk and tends to compensate for them.

Fatigue of Metals—The action that takes place in metals after a large number of applications of excessive unit stress. Fatigue failures are characterized by their suddenness and by the absence of general deformation in the piece which fails. A wire broken by repeated bending backward and forward is a characteristic fatigue failure example.

Fat-Soluble Vitamin—See Vitamins.

Fatty Acids—Organic acids which are combined as esters with glycerol in fats. The majority of the fatty acids of naturally occurring fats are straight chain acids containing even numbers of carbon atoms.

F.C.M., (Fat Corrected Milk)—See Milk, Fat Corrected.

Feathering—See Milk and Cream Defects.

Fecal Contamination—Fecal matter in milk is a source of coli bacteria in milk which is always considered very undesirable and generally indicates carelessness in the milking process.

Feces, Faeces—Excrement manure dung

Fecund—Fruitful in offspring or vegetation prolific fertile

Fecundity—This term has reference to the activity of an individual in the production of young animals that bring forth young frequently regularly and in the case of those that bear more than one offspring at a birth in large numbers are said to be fecund

Federal Crop Insurance Corporation—A United States Federal Organization that administers the program of insuring farm crops against natural hazards to receive applications collect premiums issue policies purchase store reserves analyze claims and adjust losses

Federal Farm Mortgage Corporation, (FFMC)—A United States government corporation created January 31 1931 during the great depression under the Farm Mortgage Refinancing Act to aid in the lending operations of the Federal Land Banks and the Land Bank Commissioner especially for the refinancing of mortgaged farms

Federal Land Bank—Any of twelve regional banks established in the United States under the Federal Farm Loan Act to facilitate the furnishing of capital for farmers by long-time loans. Loans were made to farmers through subsidiary co-operative farm loan associations or by agents on first mortgages only not exceeding one-half of the value of the farm plus 20% of the value of permanent improvements thereon

Federal Standards for Cheese—See Cheese

Federal Surplus Commodities Corporation, (FSCC)—A United States government non-profit agency incorporated as the Federal Surplus Relief Corporation to assist the Agricultural Adjustment Administration by buying up surplus commodities and distributing them among the states for relief use

Feed—For feeding livestock a mixture or preparation which supplies the essentials for maintenance of the body the materials for making milk for development of the fetus for growth in the immature animal and when desirable to produce gain in weight. To fulfill these requirements feeds must contain four general classes of food material proteins carbohydrates and fat mineral matter and vitamins To supply with nourishment

Feed bag—A nose bag A bag or sack for holding feed

Feedbox—A container for food for livestock.

Feed, (Concentrated)—See Feeds and Feeding

Feeder—One who or that which gives or provides food for livestock. In livestock marketing animals which lack the fat or finish to produce the most desirable grades of meat. They are very often resold on the market to farmers or feeders who expect to be able to finish them out in the feed lot to good advantage

Feeder's Margin—A term used to denote the difference in price per unit live weight of stock or feeder and fat cattle

Feed Flavor—See Milk and Cream Defects.

Feed Flavors, (Cause of)—Experiments have shown that objectionable feed flavors in milk are the result of ingestion of strong flavored feeds by the cow rather than the absorption of flavors after milk is drawn

Feeding Standards—The recommended nutrient allowances for farm animals. The nutrient allowances are for maintenance work growth production and reproduction of farm animals kept under ordinary conditions. In the past the allowances were based largely upon the requirements for digestible protein and total digestible nutrients but now considerable information is available on the requirements for such nutrients as calcium phosphorus carotene and vitamin D and they are often included

Armby Feeding Standard—A feeding standard developed by Dr. Armby in which the amount of true protein and net energy required by an animal for maintenance and milk production is recommended. True protein differs from digestible crude protein in that the true protein does not include free amino acids and amides but it is now known that these can be used by an animal so that the term "true protein" is now in general use. The amount of energy was expressed in terms which is a unit suggested by Armby to apply to 1000 large calories

Haecker Feeding Standard—A feeding standard developed by T. L. Haecker of Minnesota. His standard used the amount of digestible protein digestible carbohydrate and digestible fat required for maintaining animals of different sizes and for producing milk with varying percentages of butter fat. This standard was the first one to separate the amount of nutrients required for maintenance from the amount required

for production and for giving different requirements for milk production based on its fat percentage. Later workers have computed his requirements in digestible protein and total digestible nutrients.

Kellner's Feeding Standard—A standard developed by Dr. Kellner of Germany in 1905 in which the measure of the value of a feed for productive purposes was expressed in terms of starch values. One pound of starch was taken as the net energy unit. Except in the manner in which it is expressed, starch values are similar to Armsby's net energy value which is expressed in terms of energy.

Modified Wolff-Lehman Feeding Standard—A standard formulated by Morrison and published in the 1915 edition of *Feeds and Feeding*. Now with revisions, it is known as the Morrison Standard.

Morrison Feeding Standard—A feeding standard developed by Morrison and published in Morrison's *Feed and Feeding*. The standard is expressed in terms of digestible protein and total digestible nutrients. Requirements for energy are also given for those wishing to use energy in place of total digestible nutrients. The latter standards include not only the requirements in digestible protein and total digestible nutrients, but also the requirements for calcium, phosphorus and carotene. Standards for growing dairy animals and for almost all types of livestock are given. Many of the requirements are given for minimum and for liberal requirements.

National Research Council Standard—A standard put out on animal nutrition by a Committee of the National Research Council. Recommended nutrient allowances for dairy cattle, beef cattle, swine and poultry are given. The nutrients include digestible protein, total digestible nutrients, calcium, phosphorus, carotene and vitamin D and are given for animals of various sizes and for dairy cows producing milk of different butterfat tests.

Savage Feeding Standard—A feeding standard developed by Professor E. S. Savage of New York. It was a modification of the Haecker standard but expressed the requirements as digestible protein and total digestible nutrients. (Digestible protein + digestible carbohydrates + $2\frac{1}{4}$ times digestible fat). This standard was the first to use total digestible nutrients.

Scandinavian Feed Unit System—A system of valuing feeds by measuring the value of feeds as they compare to other feeds. One pound of barley is taken as a standard and has a feed unit value of one. The feed unit value for any other feed is the amount of that feed which is estimated to have the same productive value as one pound of barley. This system was developed in Denmark by Fjord and co-workers, but has never been used to any extent in this country.

Wolff Feeding Standards—The first feeding standard based on the digestible nutrients in feeds was developed in 1861 by Dr. Wolff, a German scientist. This standard stated the amounts of digestible crude protein, digestible carbohydrates, and digestible fat required daily by the different classes of farm animals. With their adoption in the 1870's by American farmers, the first real effort was made toward the rational feeding of farm animals.

Wolff-Lehmann Feeding Standard—A modification of the Wolff Feeding Standard formulated in 1895 by Dr. Lehmann, a German scientist. This feeding standard for dairy cows was the first one to give the requirements for different amounts of milk a cow was producing. No consideration was given, however, to the fact that more nutrients are required to produce milk rich in fat than for milk low in fat. This standard has been largely superseded by modern standards.

Feeding Tankage—See Feeds and Feeding.

Feeding the Dairy Herd—See Handbook, P. 1.

Feed Lot—A yard or plot of ground, on or in which livestock are fed a major part of their feed.

Feed Mill—A mill in which grains are ground for use, making them more suitable, palatable and efficient for food or feed.

Feed Off—To harvest by turning in livestock to pasture.

FEEDS AND FEEDING TERMS

(Most of the analyses of feeds are from Morrison's *FEEDS AND FEEDING*, twenty-second edition, by courtesy of The Morrison Publishing Company. For more detailed information on feeds and feeding see this book.)

Alfalfa, (*Medicago sativa*)—A perennial legume widely planted as a forage crop because of its high yield and beneficial ef-

fects on soil. Like other legumes it is able to fix nitrogen into the soil directly from the air.

The plant is distinguished by its dark green color, upright habit of growth and its purplish to yellow cloverlike flowers. Its roots go deep into the soil, thus it is fairly drought resistant and yields a crop even on alkali soils.

	Hay
Total dry matter	90.5%
Digestible protein	10.9%
Total digestible nutrients	50.7%
Nutritive ratio	1.57

Alfalfa Leaf Meal—A product made from the leaves and fine stems of alfalfa hay. It has a higher protein content than ordinary alfalfa meal and must not contain more than 18% crude fiber. It is used mostly for poultry feeding.

Total dry matter	92.7%
Digestible protein	16.0%
Total digestible nutrients	57.2%
Nutritive ratio	1.26

Alfalfa Meal—Ground alfalfa hay, an important product in the western alfalfa sections. It is rich in vitamins, calcium and proteins and contains not over 35% crude fiber. It is used to some extent in diluting heavy concentrates in feeding dairy cows. Its chief use is in commercial mixed feeds for poultry and swine.

Total dry matter	92.7%
Digestible protein	12.4%
Total digestible nutrients	54.4%
Nutritive ratio	1.54

Alfalfa Molasses Feed—A combination of 20 to 40% of beet or cane molasses and alfalfa meal, made in the western alfalfa districts. The mixture is palatable to stock and can be used to replace a limited amount of grain in the ration for dairy cows and other stock. It is not high in protein and therefore should be used as a substitute for grain and not as a protein supplement.

Total dry matter	87.8%
Digestible protein	6.3%
Total digestible nutrients	51.2%
Nutritive ratio	1.71

Alfalfa Seed Screenings—A concentrate feed containing up to 31% protein made by grinding the residue such as light weight alfalfa seeds, weed seeds, etc., left after cleaning alfalfa seed. Mixed with better liked concentrates, this feed may be used in the

proportion of 1 part in 4 of the concentrate ration for dairy cows.

Total dry matter	90.3%
Digestible protein	23.5%
Total digestible nutrients	74.5%
Nutritive ratio	1.21

Alfalfa Stem Meal—A product screened from ground alfalfa hay in making alfalfa leaf meal. Compared with good alfalfa meal it is higher in fiber, lower in protein and therefore has a lower feeding value.

Total dry matter	91.0%
Digestible protein	6.1%
Total digestible nutrients	42.0%
Nutritive ratio	1.59

Apples, (*Malus sylvestris*)—Contain slightly more dry matter than roots such as mangels and rutabagas; are high in sugar and very low in protein, succulent, and palatable. In feeding value for dairy cows, apples are worth about 60% as much per ton as corn silage, 1 wet as feed only as windfalls or in case of a surplus crop that cannot be marketed.

Total dry matter	17.9%
Digestible protein	0.2%
Total digestible nutrients	13.5%
Nutritive ratio	1.65

Apple Pectin Pulp—The dried residue left in the manufacture of pectin from apple pomace for jelly making. Should be mixed with well liked concentrate to increase the palatability when fed to dairy cows.

Total dry matter	91.2%
Digestible protein	2.6%
Total digestible nutrients	62.4%
Nutritive ratio	1.23

Apple Pomace—Wet apple pomace is the residue from apples after the juice is pressed out for cider or vinegar. It may be fed fresh, may be ensiled or dried. A good substitute for corn silage for dairy cows but should be fed after milking to avoid flavoring the milk.

	Silage	Wet	Concentrate Dried
Total dry matter	20.9%	21.1%	89.6%
Digestible protein	0.6%	0.5%	1.6%
Total digestible nutrients	14.5%	16.0%	61.5%
Nutritive ratio	1.228	1.310	1.393

Australian Saltbush—See Sagebrush.

Total dry matter	23.3%
Digestible protein	3.1%
Total digestible nutrients	10.6%
Nutritive ratio	1.24

Babassu Oil Meal—A product of the hard-shelled seed of a Brazilian palm (*Orbignya speciosa*). It is about equal to coconut oil meal in composition, and in feeding value for dairy cows. It is also palatable to stock.

Total dry matter	92.8%
Digestible protein	20.8%
Total digestible nutrients	81.6%
Nutritive ratio	1:2.9

Bagasse—The residue of the sugar cane after milling. This crushed, almost juiceless fiber, when mixed with cane molasses, is used to some extent for cattle feed.

In composition it contains somewhat more fiber than straw from small grains and about as much total digestible nutrients as does straw from these grains, but contains no digestible protein.

Bahia Grass, (*Paspalum notatum*)—A common hardy grass grown in Florida, along the Gulf Coast, and in Cuba. It grows well in sand-hill soil. The poor germination of the seed is its chief drawback.

Total dry matter	30.0%
Digestible protein	1.1%
Total digestible nutrients	15.9%
Nutritive ratio	1:13.5

Barley—A hardy, usually bearded cereal grain about equal to ground corn for feeding dairy cows. When ground it makes a palatable feed that is a good source of carbohydrates. However, due to its low protein content it should not be used as the only grain in the ration. Some workers report trouble with bloat when cows are fed only ground or rolled barley and alfalfa hay.

Total dry matter	90.3%
Digestible protein	10.8%
Total digestible nutrients	73.2%
Nutritive ratio	1:5.8

Barley Bran or Hulls—A feed consisting almost entirely of barley hulls and a small amount of outer coat of the kernel. In feeding value it is worth only about $\frac{2}{5}$ as much per ton for dairy cows as wheat bran.

Total dry matter	88.6%
Digestible protein	8.4%
Total digestible nutrients	65.7%
Nutritive ratio	1:6.7

Barley Feed—A by-product in the manufacture of pearled barley for human food, consisting of hulls and outer coats of the kernels. In feeding value for dairy cows a high-

grade barley feed is almost equal to wheat bran.

Total dry matter	90.3%
Digestible protein	10.8%
Total digestible nutrients	73.2%
Nutritive ratio	1:5.8

Barley Mixed Feed—A by-product in the manufacture of barley flour. It contains hulls and middlings from the kernels. Barley mixed feed has about the same composition as barley feed.

Total dry matter	90.3%
Digestible protein	10.8%
Total digestible nutrients	73.2%
Nutritive ratio	1:5.8

"Bean Pods"—See Field or Kidney Bean Straw.

Beet Molasses—The dark, viscous, syrupy residue in the manufacture of beet sugar. Digestible nutrients are about the same as cane molasses but more laxative because of the high content of alkaline salts and other laxative substances. Beet molasses is used in mixed feeds, especially in alfalfa-molasses feeds.

Total dry matter	92.2%
Digestible protein	5.9%
Total digestible nutrients	72.4%
Nutritive ratio	1:11.5

Beet Pulp—A by-product of the sugar beet industry used in both wet and dried form as a feed for dairy cattle. It is an excellent source of succulence and bulk in the ration, especially when silage is not available. See Beet Pulp Wet and Beet Pulp Dry.

Beet Pulp, (Dry)—Beet Pulp, dry is the dried residue left after extraction of sugar from sugar beet. It is high in carbohydrates and low in protein and fat, and it is very popular with dairymen when silage or green feed is not available. As a supplement for silage, dried beet pulp is soaked in approximately three times its weight of water before feeding. However, where plenty of water is available for cows, as good results are obtained with the beet pulp fed dry.

Total dry matter	91.2%
Digestible protein	4.1%
Total digestible nutrients	68.7%
Nutritive ratio	1:15.8

Beet Pulp, (Wet)—A by-product of the beet-sugar industry consisting of the residue after the beets have been processed. It is a good feed for dairy cattle but because of its low protein and phosphorus content, when fed in large quantities these nutrients must be supplied.

Total dry matter	11.60%
Digestible protein	0.8%
Total digestible nutrients	8.80%
Nutritive ratio	1:10

Beet Tops—The crowns and leaves cut from sugar beets useful for sugar production. Beet tops are laxative and should be fed with grain and legume or other hay. They also contain oxalic acid which is poisonous if fed to animals in too large amounts. The tops make satisfactory silage if allowed to dry out somewhat before ensiling.

Beggar Weed, (Desmodium tortuosum)—A leafy annual legume with woody stalks. It grows well on the sandy soils of the southern states where it is used especially for grazing purposes. It also makes good hay if cut at the beginning of its blooming period.

	Pasture
Total dry matter	27.1%
Digestible protein	2.8%
Total digestible nutrients	11.5%
Nutritive ratio	1:11

Pentgrass, ((Agrostis Species)—Perennial grasses with a loose pyramidal panicle, narrow leaves and creeping habit of growth. These grasses find use as lawn and fine turf grasses. They are noted as low fertility grasses.

Bermuda Grass, (Cynodon dactylon)—A sub-tropical long lived spreading grass growing 6 to 12 inches high, useful for pasture and lawns and sometimes for hay. Used extensively in the Southeast for pasture and to a limited extent for hay purposes.

	Pasture
Total dry matter	25.0%
Digestible protein	2.0%
Total digestible nutrients	15.0%
Nutritive ratio	1:6.5

"Billion Dollar Grass"—See Japanese Millet.

Birdsfoot Trefoil—See Trefoil, Birdsfoot.

Black Medic, (Medicago lupulina)—See Yellow Trefoil.

Black Strap—A low-grade molasses often fed to dairy cattle to improve the palatability of a ration. An excellent source of energy. Digestible nutrients:

Protein	1.0%
Carbohydrates and Fat	58.2%

Blood Flour—Finely ground blood meal.

Blood Meal—Meal made from blood collected at packing plants. The blood is thoroughly coagulated and heated. The residue of which is dried and ground. Blood meal contains over 80% protein. It is not highly digestible and is low in calcium and phosphorus. By a special process a more soluble product called "soluble blood meal or flour" is made. It is used chiefly for feeding calves.

Blue Grama (Bouteloua gracilis)—A low growing drought resistant highly palatable species of grass that is dominant on much of the western range land. The leaves are thin and close to the ground level while the purplish flowering spikes are found at a sharp angle to the 12 to 18 inch flowering stalk.

	Pasture
Total dry matter	49.7%
Digestible protein	4.5%
Total digestible nutrients	27.6%
Nutritive ratio	1:4

Bluegrass, (Poa pratensis)—Also known as June grass. It is the ranking pasture or lawn grass in the northern half of the United States except where climate is too dry. In protein content in early spring it compares well with alfalfa hay. It is resistant to cold weather and grows best in soil high in calcium. This accounts for its popularity in states like Kentucky where the soil is rich in this mineral. It is usually grown in combination with white clover.

	Pasture
Total dry matter	30.2%
Digestible protein	4.1%
Total digestible nutrients	20.7%
Nutritive ratio	1:4.0

Bluestem, (Andropogon Species)—Tall growing bunchgrasses regarded as dependable forage grasses in the tall grass prairie of the central states.

	Pasture
Total dry matter	81.7%
Digestible protein	0
Total digestible nutrients	37.5%
Nutritive ratio	

Bone Black, (Spent)—A by product in the use of bone meal in the clarifying and decolorizing of the syrup in the manufacture of sugar. It contains about two-thirds as much calcium and phosphorus as bone meal but is not as palatable.

Bone Meal, Steamed—Most commonly used phosphorus supplement for stock feeding. It is made from fresh bones of good quality cooked under pressure to make more porous. Nearly all protein and fat is removed in

the steaming process. The dried, ground bone or meal is nearly white in color and should have little odor.

It contains approximately 30% calcium and 13.9% phosphorus according to the National Research Council.

Bran—The broken coat of the seed of wheat, rye, or other cereal grain, separated from the flour or meal by sifting or bolting; the coarse, chaffy part of ground grain. See Wheat bran.

Brewers' Grains—A residue from the brewing of barley in the manufacture of beer and some "soft" drinks. The grains are dried after the sugar is extracted, they are quite bulky and as they are medium high in protein, are often used to an advantage. However, they are low in digestible nutrients and high in crude fiber, and not very palatable.

Brewers' Dried Grains—Wet brewers' grains thoroughly dried to preserve the nutritive qualities and to keep them from spoiling are placed on the market as brewers' dried grains. They are not high in total digestible nutrients.

Total dry matter	93.0%
Digestible protein	22.0%
Total digestible nutrients	67.1%
Nutritive ratio	1:2.1

Brewers' Wet Grains—A brewery by-product often a cheap source of feed for cattle near the breweries. The wet barley mash remaining after the solution of sugars and other soluble substances, called wort, have been extracted from the barley malt. The product spoils easily and should be fed while fresh and clean to avoid digestive disturbances in cattle as well as tainting and off-flavors in the milk. Should be fed after milking in amounts not more than 20-30 lb. per cow per day, along with good roughages and other concentrate feeds.

Total dry matter	23.7%
Digestible protein	4.2%
Total digestible nutrients	16.1%
Nutritive ratio	1:2.8

Bromegrass, Smooth, (Bromus inermis)—A drought-resistant forage plant grown extensively in many parts of the country to-day in combination with clovers, etc. It is a rhizomatous, long-lived, sod-forming grass adapted to regions of moderate summer temperatures and moderate rainfall where it provides both pasture and hay. The plant is noted for its high palatability, has an abundance of basal leaves and grows to a

height of 3 to 4 feet. The inflorescence is a panicle.

	Hay	Pasture
Total dry matter	88.8%	25.0%
Digestible protein	5.3%	3.9%
Total digestible nutrients	49.3%	18.3%
Nutritive ratio	1:8.3	1:3.7

Buckwheat, (Fagopyrum esculentum)—Not a true cereal but with about the same general nutritive characteristics as the cereal grains. The kernel is small and hard and should not be used whole except in poultry feeding. Buckwheat flour is used largely as human food and the by-products of milling are used for feeding dairy cattle and other livestock. This feed is less palatable than most of the cereals but the plant can be grown on soil too poor and sandy for any of the ordinary cereals to be grown profitably. Its fragrant, pink blossoms are much liked by bees. The protein of buckwheat is not of high quality. It has a little less protein than oats and approximately one-half as much fat and contains a little less total digestible nutrients.

Buckwheat Bran—Same as Buckwheat Feed.

Buckwheat Feed—A mixture of buckwheat middlings and hulls of varying quality, used to a very limited extent as a dairy cattle feed. It is also known as buckwheat bran. The feeding value depends upon the amount of middlings used in the mixture, since buckwheat hulls have very little nutritive value.

Digestible nutrients in average mixture (good grade)

Total dry matter	89.3%
Digestible protein	11.7%
Total digestible nutrients	52.5%
Nutritive ratio	1:3.5

Buckwheat Middlings—Portions of the buckwheat grain immediately inside the hull which have been separated from the flour in milling. They are a satisfactory protein supplement for dairy cows, but for best results they should not constitute more than $\frac{1}{3}$ the concentrate mixture. They are also called buckwheat shorts.

Total dry matter	88.7%
Digestible protein	25.8%
Total digestible nutrients	75.7%
Nutritive ratio	1:1.9

Buffalo Grass, (Buchloe dactyloides)—A low-growing, fine-leaved, sod-forming grass native to the Great Plains. A highly nutritious grass, it is the dominant species on large areas of the short-grass region.

	Pasture
Total dry matter	36.7%
Digestible protein	1.9%
Total digestible nutrients	20.5%
Nutritive ratio	1.98

Buffalo Clover—A type of clover found in the western United States throughout the former range of the bison

Bundle Corn—Same as Shock Corn

Cabbage, (*Brassica oleracea*, member of the mustard family)—A succulent palatable forage for milk cows but uneconomical except in regions where the crop is grown for vegetable marketing. If flavors the milk unless fed after milking

Cacti—Used as an emergency forage for stock in the semi arid regions of the south west. Cacti are low in protein and should be fed with a protein rich concentrate or roughage. Prickly pear cacti (*Opuntia* spp) contain about 16.6% dry matter and cane cacti (*Cholla*, spp) slightly more. If fed in large amounts with no dry feed cacti produce scours

Prickly pear cacti	
Total dry matter	16.6%
Digestible protein	0.4%
Total digestible nutrients	9.4%
Nutritive ratio	1.225

Cane Cacti	
Total dry matter	21.0%
Digestible protein	0.7%
Total digestible nutrients	12.3%
Nutritive ratio	1.166

Caddo Cake—Same as Whole-Pressed Cottonseed

Calcium-Phosphorus Ratio—A proper ratio should be maintained between calcium and phosphorus in addition to feeding sufficient calcium and phosphorus to dairy animals. Bad effects may result if a large excess of one or the other is fed even though both are fed in sufficient amounts

"Calf Starters"—Mixtures of dried skim milk and farm grains reinforced with protein mineral and vitamin supplements may be fed successfully to vigorous calves after they reach the age of six to eight weeks

Experiments indicate that these calf starters can be fed from an earlier age, even after one to two weeks. They are used particularly where limited milk feeding program is practiced because of no available skim milk.

Canada Bluegrass, (*Poa compressa*)—A grass rough like Kentucky Bluegrass except the foliage is blue-green, the culms are flat, and the panicles are contracted. The grass is rhizomatous like Kentucky Bluegrass. An important pasture grass which grows well on heavy clay soils and also dry and shaded locations in New England, Ontario, New York, Pennsylvania, the Virginias and Maryland

	Pasture
Total dry matter	33.2%
Digestible protein	1.9%
Total digestible nutrients	19.9%
Nutritive ratio	1.95

Canada Wild Rye, (*Elymus canadensis*)—A coarse perennial vigorous bunchgrass abundant in the Rocky Mountain States, Pacific Northwest and Great Plains. The tall plants 3 to 5 feet tall, are topped by a long purple rye like spike when mature

Cane—Common name for the sweet sorghum plant

Cane Hay—Sweet Sorghum Hay—Hay of fodder made from sweet sorghum. It is more palatable than corn fodder and is lower in fiber and slightly richer in protein and total digestible nutrients than average timothy or prairie hay. Shredding or cutting before feeding it to cows prevents waste

	Sorghum Fodder
Total dry matter	24.9%
Digestible protein	0.8%
Total digestible nutrients	17.3%
Nutritive ratio	1.206

Cane Molasses—A thick, dark-colored viscous syrup—the residue from the manufacture of sugar from sugar cane. It is a very palatable carbohydrate, is mildly laxative and is used as an ingredient in many of the mixed feeds. It enhances the feeding value of highgrade feeds and makes less valuable feeds more appetizing. Millions of gallons are used annually in the U.S. for this purpose. It is also called Blackstrap

Total dry matter	73.4%
Digestible protein	0
Total digestible nutrients	53.7%
Nutritive ratio	---

Carob-Bean Meal (*Ceratonia siliqua*)—Ground pods and seeds of a legume tree grown chiefly in Mediterranean districts. It is used chiefly in certain mixed feeds for calves. As part of the ration for dairy calves it equals ground barley. It is also known as St. John's Bread

Carpet Grass, (*Axonopus compressus*)—A perennial, creeping pasture grass grown on the moist, sandy lowlands in the southern states where it ranks second to Bermuda grass. It is only fairly nutritious.

	Hay	Pasture
Total dry matter	92.1%	25.0%
Digestible protein	3.6%	1.2%
Total digestible nutrients	47.7%	16.0%
Nutritive ratio	1:11.9	1:12.3

Cassava Meal—A by-product from cassava (*Manihot utilisima*) starch factories. It is rich in nitrogen, free extract, low in fiber, and very low in protein and fat. Cassava meal is about equal to grain in feeding value and may be used as a substitute for part of the grain in feeding dairy cows. It is also called Manihot Meal.

Total dry matter	86.8%
Digestible protein	0
Total digestible nutrients	70.4%
Nutritive Ratio	---

Catch Crop—A fast growing short season crop such as millet, rape, buckwheat, etc. which may be sown later in summer than other crops and still make a satisfactory yield. Frequently planted in cases of crop failure.

Cereal—Any grain or grass yielding farinaceous seeds which can be used for food, as wheat, corn, or rice. The seeds or grain so produced, either in natural form or commercially prepared.

Cereal Hays—Generally included in this group are wheat, oats, rye, rice, barley. Under emergency conditions, such as drought, cereal grains are cut for hay when the cereal plants are not likely to fill or mature for grain. When cut at the proper stage the cereals make a very palatable roughage. They are very low in calcium and in phosphorus, but are rich in vitamins B₁ and E. Give best results when fed with some other roughage.

Ceres—The Greek goddess of growing vegetation.

Chopped Hay—Occasionally hay is chopped for storage or to induce consumption of the coarser parts. As this in no way increases digestibility, the practice is usually considered economical for dairy cattle feeding only so far as it facilitates storage or prevents undue waste.

Citrus By-Products—Feed for cattle made from residue of citrus fruit used in making citrus fruit juice, canned fruit, and other products. The peel, the residue of the inside portion, seeds, and cull fruits go into this feed which may be fed fresh near the canneries or may be dried. See Dried Orange Pulp, Dried Grapefruit Refuse, and Dried Lemon Pulp.

Citrus Pulp—A by-product of the citrus-canning industry, consisting of the peels, inside portion and seeds, and sometimes the entire cull fruit, which is ground, dried and called citrus pulp. It is high in calcium but low in phosphorus.

Total dry matter	90.0%
Digestible protein	2.7%
Total digestible nutrients	74.9%
Nutritive ratio	1:26.7

Clipped Oats—Oats from which the ends of the hulls have been clipped by running them through an oat clipper. This process increases the weight per bushel and decreases the fiber content.

Clipped Oat By-Product—A by-product in the manufacture of clipped oats composed of the light ends of the hulls, empty hulls, light immature oats and dust. It is used as an ingredient in some mixed feeds, and is also known as Oat Clippings.

Total dry matter	92.9%
Digestible protein	3.5%
Total digestible nutrients	30.7%
Nutritive ratio	1:60.4

Clover—A group of leguminous plants of the genus *trifolium* which makes a hay of high food value and also one of the best pasture plants. There are many types of clovers, the most common being

Sweet clover	Ladino clover
Red clover	Lespedeza clover
White clover	Strawberry clover
Mammoth clover	Subterranean clover
Alsike clover	

Alsike Clover, (*Trifolium hybridum*)—A fine-stemmed, highly palatable variety of clover used as a hay and pasture crop for dairy cattle. It is not grown as extensively as alfalfa and red clover because it is a low yielder. Its advantage lies in the fact that it grows on soils that are either too wet or too acid for other clovers.

	Hay	Pasture
Total dry matter	88.9%	22.9%
Digestible protein	8.1%	3.2%
Total digestible nutrients	53.2%	15.7%
Nutritive ratio	1:5.6	1:5.9

Berseem Clover, (*Trifolium alexandrinum*)
—An annual clover adapted to hot climates of the Imperial Valley of California. In Egypt it is widely used as a hay crop, green soiling crop and for green manure. It is also known as Egyptian Clover. It is a heavy producer and may be cut several times a year under favorable conditions.

	Hay
Total dry matter	90.6%
Digestible protein	9.0%
Total digestible nutrients	51.9%
Nutritive ratio	1:1.8

Bur Clover—There are over forty species of these plants all native of the Mediterranean region, most are annuals, prostrate in form but if planted thickly, make a mass of herbage eight to eighteen inches deep. They are used principally for pasture. Two species are common in America.

	Pasture
Total dry matter	20.8%
Digestible protein	3.9%
Total digestible nutrients	15.1%
Nutritive ratio	1:2.9

California Bur Clover, (*Medicago lupida*)—A winter annual grown chiefly in California and Texas. It is a valuable pasturage and an excellent supplement to Bermuda grass. It is also known as Toothed Bur Clover.

	Pasture
Total dry matter	20.8%
Digestible protein	3.9%
Total digestible nutrients	15.1%
Nutritive ratio	1:2.9

Crimson Clover, (*Trifolium incarnatum*)—An annual leguminous plant used mainly as a green manure crop grown extensively in the South and adapted to poor soils. When used as a hay, it must be cut before its wirelike hairs become hard and stiff, to avoid trouble in the intestinal tract of animals feeding on the hay.

	Pasture
Total dry matter	17.4%
Digestible protein	2.3%
Total digestible nutrients	11.5%
Nutritive ratio	1:5.9

Egyptian Clover, (*Trifolium alexandrinum*)—See Berseem Clover.

Hop Clover, (*Trifolium procumbens* or *dubium*)—An annual, low-growing clover which furnishes good early pasture in some parts of the South and on the northern Pacific slope.

	Pasture
Total dry matter	25.6%
Digestible protein	2.8%
Total digestible nutrients	18.5%
Nutritive ratio	1:5.6

Hulam Clover—An annual variety of white sweet clover which has not proved to be better than the perennials for hay and pasture but is excellent as a green crop to plow under. In the fall it seeded in the spring grains.

Japan Clover—See Lespedeza.

Ladino Clover—A large growing variety of white clover originating near Lodi, Italy. It is especially valuable as a pasture crop in the irrigated sections of the northwestern states and in the temperate humid middlewest and northeast.

It is apt to cause bloat in cattle and sheep.

	Pasture
Total dry matter	16.6%
Digestible protein	3.5%
Total digestible nutrients	12.4%
Nutritive ratio	1:2.8

Mammoth Clover, (*Trifolium pratense* perenne)—A leguminous plant used as a hay and pasture crop for dairy cattle, mostly in the southern states. Although it resembles red clover its growth is ranker and coarser, and it is less palatable than red clover. It is frequently used as a green manure crop.

	Hay	Pasture
Total dry matter	88.0%	25.1%
Digestible protein	6.7%	2.8%
Total digestible nutrients	52.0%	16.4%
Nutritive ratio	1:6.8	1:4.9

Red Clover—An upright, usually considered a biennial legume distinguished by the large numbers of red flowers borne in the form of a head. Chief uses are as hay or pasture alone or in mixtures. Widely used in combination with timothy and alsike clover.

	Pasture	Hay
Total dry matter	18.1%	88.1%
Digestible protein	2.8%	7.1%
Total digestible nutrients	15.2%	52.2%
Nutritive ratio	1:3.7	1:6.4

Red Clover Seed Screenings—Ground residue from cleaning red clover seed. Very similar to alfalfa seed screenings in composition.

Southern Bur Clover, (*Medicago arabica*)—A hardy winter annual found chiefly in the southern states. It is a valuable pasture grass and is an excellent supplement to Bermuda pasture. Also known as Spotted Bur Clover.

Subterranean Clover, (*Trifolium subterraneum*)—A winter annual resembling bur clover. It is adapted to some sections in the southern states, and is an important pasture crop in parts of Australia.

Toothed Bur Clover—See California Bur Clover.

White Clover, (*Trifolium repens*)—A perennial leguminous plant having a nearly white blossom occurring naturally in many lawns and pastures and hayfields. It is used mostly as a pasture crop for dairy cattle and since it is a very low hay yielder, it is seldom ever cut for hay. It is very palatable and high in protein. The white flowers furnish a favorite food for bees.

	Pasture
Total dry matter	17.8%
Digestible protein	4.1%
Total digestible nutrients	12.9%
Nutritive ratio	1:2.1

White Dutch Clover—A longer-lived wild type of white clover with smaller leaves, sometimes appearing spontaneously in pastures under favorable conditions.

Cobalt, (Co.)—A tough, lustrous, silver-white metal related to, and occurring with, iron and nickel.

It is an essential mineral for cattle. Reports from New Zealand, Australia, Florida, and New Hampshire show some Cobalt-deficient areas. Recent research work shows remarkable response to the addition of Cobalt to the ration of animals. Cobalt-deficient animals show long rough coat of hair, scalliness of skin, loss of appetite, and atrophy of muscles. Animals are often listless and there seems to be delay in sex development.

A deficiency of cobalt in dairy cattle forage has been found in a few sections of the U. S. and also in parts of New Zealand and Australia. This condition may be corrected by the addition of minute quantities (approx. $\frac{1}{4}$ lb.) of cobalt salts, scattered over each acre of ground. Many feed manufacturers are adding minute quantities of cobalt to their feed rations.

Cocksfoot—English name for Orchard Grass. See Orchard Grass.

Cocoa Shells—The hard outside coating of the cocoa bean ground and used in a few mixed feeds. Only a small portion of the crude protein is digestible. It should be fed only to adult cattle and never in quantities greater than 2 lb. per head daily.

Coconut Cake—A feed for dairy cattle made from the coconut (*Cocos nucifera*) after most of the oil has been pressed from it. It has a slightly higher feeding value than corn gluten feed, but is less palatable than wheat bran and linseed meal. In chemical composition it resembles gluten feed. Also called Copra Meal.

Total dry matter	93.0%
Digestible protein	18.0%
Total digestible nutrients	77.0%
Nutritive ratio	1:3.3

Coconut Meal—Same as Coconut cake except that it is ground and is slightly more digestible.

Total dry matter	93.0%
Digestible protein	18.0%
Total digestible nutrients	77.1%
Nutritive ratio	1:3.3

Cod-Liver Oil—An oil obtained from the liver of the codfish. Used as a vitamin A and D supplement, especially for humans and poultry. Not widely used for herbivora because of possible injurious effects.

Colza Oil Meal—See Rape-Seed Oil Meal.

Commercial Mixed Feeds—Various mixtures of concentrates (grains and by-products, etc.) often fortified with suitable minerals and vitamins, formulated, prepared and marketed by feed companies for use in feeding dairy cattle and other classes of stock.

Concentrate—An animal feed low in fiber and high in digestible nutrients, as grain and linseed meal.

Copra—The dried coconut meat from which coconut oil is obtained. See Coconut cake.

Copra Meal—See Coconut Meal.

Corn—One of the important grains grown on the American continent and extensively used for feeds. Fully described under Corn.

	Grade I	Grade II	Grade III
Total dry matter	87.0%	85.0%	83.5%
Digestible protein	6.9%	6.7%	6.5%
Total digestible nutrients	81.9%	80.1%	78.6%
Nutritive ratio	1:10.9	1:11.0	1:11.1

Corn, Dent—The most commonly grown field variety, identified by the small depression in the top of the kernel when dry for analysis see Corn

Corn and Cob Meal—The feed resulting from the grinding of the ear corn including the cobs. It is slightly lower in protein and more fibrous than corn meal but more bulky and hence suitable for use with heavy feeds. It is also called Ear Corn Chops

Total dry matter	86 1%
Digestible protein	5 4%
Total digestible nutrients	73 2%
Nutritive ratio	1 12 6

Corn and Oat Chop—See Corn and Oat Feed.

Corn and Oat Feed—A feed consisting of a mixture of good-grade corn and oats or low-grade materials such as oat hulls, ground corn cobs and other refuse. It is used extensively in the eastern and southern states for feeding dairy cows and especially horses. It is also called Corn and Oat Chop, Ground Corn and Oats, Ground Feed and Provender.

Total dry matter	89 4%
Digestible protein	8 4%
Total digestible nutrients	77 2%
Nutritive ratio	1 8 2

Corn Bran—A by product in the manufacture of starch or glucose consisting of the outer layer of the corn kernel, including hull and tip cap. It is usually mixed with other by products. Does not contain much more protein than corn grain.

Total dry matter	90 4%
Digestible protein	5 6%
Total digestible nutrients	69 4%
Nutritive ratio	1 11 4

Corn Chop—Coarse feed consisting of bran, husk, and germ fragments removed from corn which is being ground into meal. Corn chops, ground ear corn, corn and cob all mean the entire ground ear corn including the cobs. It is generally estimated that the cobs make up about 20% of the weight of corn cob meal. Obviously corn and corn cob meal is a more bulky feed than is plain ground corn. When the ear corn in the husks is ground, the product is called ear corn chops with husks or ground snap corn.

Corn Cob—The chaffy axis on which the kernels of corn are arranged in rows.

Corn Fodder—A term used for corn plants grown for forage. The plant, with all its corn ears as grown, may be used either fresh or cured. It is usually cut while stalks, leaves and ears are green and tender, and fed with or without husking. Also called Fodder Corn.

	Pasture
Total dry matter	26 5%
Digestible protein	1 2%
Total digestible nutrients	19 1%
Nutritive ratio	1 14 9

Corn Germ Cake—See Corn Germ Meal.

Corn Germ Meal—A by product sometimes produced in the dry milling of corn for corn meal, hominy grits, etc. It is like corn oil meal in composition and feeding value but slightly lower in protein and higher in nitrogen free extract.

Also called Corn Germ Cake

Total dry matter	93 0%
Digestible protein	14 9%
Total digestible nutrients	76 1%
Nutritive ratio	1 4 1

Corn Grits—Coarse feed consisting of the hard starchy portions of corn containing no bran or germ.

Total dry matter	88 4%
Digestible protein	6 5%
Total digestible nutrients	80 8%
Nutritive ratio	1 11 4

Corn Gluten Feed—Corn gluten meal with corn bran added. This feed has more bulk and palatability than gluten meal, although it is lower in protein.

Total dry matter	90 3%
Digestible protein	21 3%
Total digestible nutrients	74 1%
Nutritive ratio	1 2 5

Corn Gluten Meal—A by product of starch manufacture used as a feed for cattle. It is composed largely of the protein of the kernel. It is high in digestible protein but lacks bulk and is apt to be unpalatable if fed alone.

Total dry matter	91 6%
Digestible protein	36 7%
Total digestible nutrients	79 7%
Nutritive ratio	1 1 2

Corn Meal—The feed resulting from the grinding of the entire corn grain. It is palatable and a good source of energy, but is low in protein and minerals. It is also known as Ground Corn, Corn Chop, and Corn Feed Meal.

Total dry matter	87.8%
Digestible protein	7.0%
Total digestible nutrients	82.6%
Nutritive ratio	1:10.8

Corn Oil Cake—A by-product in the manufacture of corn oil for human food. The corn oil cake is ground before feeding in which case it is called corn oil meal.

Corn Oil Meal—A dairy feed made from corn germs which have been removed generally by the wet milling process. It is dried and crushed and most of the oil is removed for human food or other purposes. This by-product is sold as such or goes into gluten feed. Sometimes this feed is sold in the form of a cake known as corn oil cake.

	Old	Solvent
Total dry matter	91.6%	91.0%
Digestible protein	16.1%	15.7%
Total digestible nutrients	76.9%	69.6%
Nutritive ratio	1:3.8	1:3.4

Corn Stover—Cured shock corn from which the ears have been removed. Its chief feeding value lies in its dried leaves rather than in the corn stalk.

Total dry matter	90.6%
Digestible protein	2.1%
Total digestible nutrients	51.9%
Nutritive ratio	1:23.7

Shock Corn—A term used for corn grown primarily for grain but fed without husking. After the ears are fairly well matured, but while its leaves are still green, the corn plant is cut and placed in shocks to cure. Also known as Bundle Corn.

Total dry matter	91.1%
Digestible protein	3.8%
Total digestible nutrients	58.8%
Nutritive ratio	1:14.5

Shredded Corn—Corn which has been passed through a feed cutter or shredder. The resulting cut or shredded corn has for its only advantage the reduction of waste, as it induces the cattle to eat a greater part of the stalks, unless they are coarse and woody. This finer material is not more digestible than the uncut forage.

Soft Corn—Generally means corn that has been frosted before grain matures. Such ears contain too much water for ordinary storage. This type of corn can best be utilized for fairly immediate stock feeding or the crop may be ensiled. It, of course, can also be cut and shocked and allowed to dry

in well built shocks in the field after which it can be fed.

Soft corn should be used up during the cold weather as it readily spoils when weather becomes warm.

Cold-Pressed Cottonseed Cake—Same as Whole-Pressed Cottonseed.

Cottonseed Cake—See Cottonseed meal.

Cottonseed Feed—A mixture of cottonseed meal and some cottonseed hulls, resembling cottonseed meal. Because of the use of cottonseed hulls, its value depends on the amount of protein and fiber it contains.

Total dry matter	92.4%
Digestible protein	27.0%
Total digestible nutrients	65.4%
Nutritive ratio	1:1.4

Cottonseed Hulls—A by-product of cottonseed oil. It is one of the important roughages in the South, especially for cattle. It is very low in protein, low in calcium and phosphorus, and lacks vitamins. It is high in fiber and not very digestible. Cottonseed hulls should be fed with good feeds to correct their deficiencies.

Total dry matter	90.8%
Digestible protein	0.7%
Total digestible nutrients	43.7%
Nutritive ratio	—

Cottonseed Hull Bran—A feed made from ground cottonseed hulls. The lint is first removed from the seeds at oil mills for paper making and other purposes, and the hulls are then ground. Cottonseed hull bran has the same value as ordinary cottonseed hulls.

Total dry matter	90.8%
Digestible protein	0.7%
Total digestible nutrients	43.7%
Nutritive ratio	—

Cottonseed Meal, (Cottonseed Cake)—The residue of cottonseed after the oil has been extracted. The kernels are separated from the hulls by shakers and beaters with metal screens. The kernels are then crushed into thin flakes, cooked by steam, placed between cloths, and put in hydraulic presses.* As much of the oil as possible is expressed and the residue is cottonseed cake, formed in hard slabs. A very large part of the cake is fed in the form of meal.

*Are now also using expeller and solvent extraction methods.

Total dry matter	91.3%
Digestible protein	37.4%
Total digestible nutrients	95.1%
Nutritive ratio	1:1.0

Cottonseed, Whole-Pressed—By product of whole cottonseed including the hull processed in expeller machines at oil mills. It is lower in protein and higher in fiber than cottonseed meal but may be fed to stock in the same manner. Also called Cold pressed Cottonseed Cake. Whole pressed cottonseed may be ground and sold as ground whole pressed cottonseed.

Total dry matter	92.4%
Digestible protein	20.2%
Total digestible nutrients	58.6%
Nutritive ratio	1.19

Couch Grass—See Quack Grass

Cowpea (*Vigna sinensis*)—A hot weather annual which is regarded as the most important legume in the cotton belt. It is chiefly grown for forage and green manure. Its special value lies in the fact that it will grow on all types of soil with but little attention.

	Pasture
Total dry matter	16.3%
Digestible protein	2.2%
Total digestible nutrients	10.8%
Nutritive ratio	1.59

Cowpea Hay—Hay made from the cowpea. It is difficult to cure but when of good quality is high in nutritive value. See Cowpea.

	Hay
Total dry matter	90.4%
Digestible protein	12.3%
Total digestible nutrients	51.4%
Nutritive ratio	1.32

Crested Wheatgrass (*Agropyron cristatum*)—A hardy perennial bunchgrass well adapted to the Great Plains and intermountain region. The plant produces an abundance of basal as well as stem leaves. Seeds are carried in spikes that form comb-like crescents. High palatability and good quality together with its hardness make this a good grass for the drier sections of the country.

	Pasture
Total dry matter	60.0%
Digestible protein	1.7%
Total digestible nutrients	32.2%
Nutritive ratio	1.17.9

Crop, Forage—A plant grown primarily for livestock feed and of which all or nearly all the plant parts are harvested by man. Forage crops include all grasses and legumes cut for hay or silage and also harvested root crops such as turnips, rutabagas, sugar beets and mangels when they are fed to livestock.

Dallis Grass (*Paspalum dilatatum*)—A perennial fairly drought resistant southern pasture grass growing in clumps or bunches 2-4 feet high. It is subject to fungus growth poisonous to cattle if allowed to head out.

	Pasture
Total dry matter	25.0%
Digestible protein	2.2%
Total digestible nutrients	16.0%
Nutritive ratio	1.63%

Dango (Silage)—A grain sorghum a hybrid between kahr and a sweet sorghum which is about 3 or 4 feet tall is very leafy and has juicy stalks. It produces a good yield of grain (somewhat bitter because of a high content of tannin) but is valuable as a feed for cattle.

Total dry matter	90.0%
Digestible protein	7.4%
Total digestible nutrients	82.6%
Nutritive ratio	1.10.2

Defluorinated Rock Phosphate—When rock phosphate or superphosphate is heated to a high temperature to drive off the fluorine it is known as defluorinated rock phosphate. There should not be more than 0.3% fluorine in it and it can be fed in the same way and in the same quantities as steamed bone meal.

Dicalcium Phosphate—This mineral supplement is made from rock phosphate and contains approximately 18% phosphorus. It can be used quite satisfactorily as a phosphorus supplement if it does not contain more than 0.3% fluorine.

Digester Tankage—A protein rich packing plant by product consisting of fresh meat scraps, trimmings and scrap bones processed by the wet rendering method, dried and ground. The product contains from 40 to 60% protein and is used as a source of animal protein for stock (usually pigs). It is also called Meat Meal Tankage or Feeding Tankage.

Total dry matter	92.8%
Digestible protein	40.5%
Total digestible nutrients	60.8%
Nutritive ratio	1.03

Dried Beet Pulp—The dried by product of the sugar beet industry. It is low in protein high in carbohydrates and is used as a source of bulk and when moistened with water as a source of succulence in the ration. It is also slightly laxative and a good conditioner especially for cows on official test.

Total dry matter	92.2%
Digestible protein	5.9%
Total digestible nutrients	72.4%
Nutritive ratio	1:11.3

Dried Grapefruit Refuse—Dried citrus pulp and dried beet pulp in general are about equal in content of total digestible nutrients and readily eaten by cattle once accustomed to it. See Citrus Pulp.

Total dry matter	91.4%
Digestible protein	1.5%
Total digestible nutrients	73.3%
Nutritive ratio	1:47.9

Dried Lemon Pulp—Extracted peel, pulp and seeds from the manufacture of citric acid from lemons. It is not palatable to stock because of the bitter taste and must be mixed with other feeds. Dried lemon pulp is equal to dried beet pulp in total digestible nutrients.

Total dry matter	92.8%
Digestible protein	2.9%
Total digestible nutrients	72.7%
Nutritive ratio	1:24.1

Dried Molasses-Beet Pulp—A combination of beet molasses and beet pulp which has been dried and put on the market as a feed for dairy cows and other stock. For dairy cows, it is about equal in feeding value to ordinary dried beet pulp and is best when mixed with more concentrated feeds.

Total dry matter	80.5%
Digestible protein	4.4%
Total digestible nutrients	60.8%
Nutritive ratio	1:12.8

Dried Orange Pulp—A by-product of citrus-fruit canning. Dried orange pulp is palatable to dairy cows and mildly laxative. It is about equal to dried beet pulp when fed as part of a good concentrate mixture. It is lower in fiber, richer in nitrogen-free extract, and contains slightly more total digestible nutrients than dried beet pulp. See Citrus Pulp.

Pulp	
Total dry matter	87.9%
Digestible protein	6.1%
Total digestible nutrients	78.4%
Nutritive ratio	1:11.9

Dry D, (Borden's)—Dry Vitamin D supplement for animal feed.

Dry Mash—A mixture of bran, meal, and other feeds, fed dry to livestock.

Dry-Rendering Method—A method of processing scrap meat and bone by cooking in a fat-melter, an open steam-jacketed vessel

with paddles to agitate the mass. After moisture is evaporated, excess fat drained, and the solid matter put through a screw press to remove more fat, the residue is ground into a meal. It is more efficient than the wet-rendering method.

Dry-Rendered Tankage—A packing plant by-product made by the dry-rendering method. It is lighter in color, has a lower protein content but a higher quality of protein than digester tankage. It is also known as Meat Meal or Meat Scraps. If tankage contains enough bone so that the phosphorus content exceeds 4.4%, the word "Bone" must be included in the name on the label, e.g., Meat and Bone Scraps, Etc.

60% Protein grade

Total dry matter	91.2%
Digestible protein	45.0%
Total digestible nutrients	66.7%
Nutritive ratio	1:0.5

Durra—A grain sorghum, grown extensively for feed in certain districts of California. Its medium-sized, dry, pithy stalks lodge readily, sucker badly, and have few leaves. The seed heads shatter easily and are difficult to harvest because of their pendant position. It is widely grown for food in the hot climes of Southern Asia and North Africa, from which it was introduced into the U. S. in 1874.

	Fodder, Pasture
Total dry matter	29.9%
Digestible protein	0.9%
Total digestible nutrients	16.6%
Nutritive ratio	1:17.4

Dwarf Essex Rape, (Brassica napus)—A member of the turnip and cabbage family grown extensively in the United States as a temporary pasture crop or a soiling crop. Rape requires a rich soil and plenty of moisture and is an excellent late autumn feed because it withstands severe frosts.

Pasture	
Total dry matter	16.3%
Digestible protein	2.4%
Total digestible nutrients	12.8%
Nutritive ratio	1:4.3

Earth Nut—See Peanut.

Emmer, (Triticum sativum, dicoccum)—A grain belonging to the wheat family although it resembles barley in appearance. It closely resembles oats in feeding value.

	<i>Hay</i>
Total dry matter	90.0%
Digestible protein	5.2%
Total digestible nutrients	43.1%
Nutritive ratio	17.3

Feed, Concentrated—The cereals and leguminous seeds together with the high grade by products are known as the concentrates

Any feeding stuff relatively rich in total digestible nutrients and low in fiber. It includes grain, gluten meal, cottonseed meal and the like

Feeding Tankage—See **Digester Tankage**

Fetenta—One of the earliest grain sorghums important in the Northwestern section of the sorghum belt and often used as a catch crop. It is closely related to *durra*. The stems are slender and have fewer leaves than *kafir*. The heads are erect and seeds are large and whitish

	<i>Grain Concentrate</i>
Total dry matter	89.4%
Digestible protein	9.5%
Total digestible nutrients	79.8%
Nutritive ratio	17.4

Field Bean Feed, (*Phaseolus*, spp.)—Feed made from hulls of a variety of beans such as navy, lima, pinto, tepary and kidney. Usually the product contains a quantity of waste and dirt and is not very palatable to dairy cows but when ground into meal can be fed as a small part of the protein ration when mixed with other concentrates

	<i>Dry Concentrate</i>
Total dry matter	90.0%
Digestible protein	20.2%
Total digestible nutrients	78.7%
Nutritive ratio	12.9

Field or Kidney Bean Straw—Used for feed for livestock in bean-growing districts. When of good quality and when fed with good hay it has a feed value equal to well-cured corn or sorghum fodder. It is often called bean pods

Total dry matter	89.1%
Digestible protein	3.0%
Total digestible nutrients	42.2%
Nutritive ratio	14.1

Field Pea—A species of pea with bluish flowers and angled seeds grown for forage especially in the cooler parts of North America

Field Pea Hay, (*Pisum arvense*)—A protein-rich hay of high quality made from Canada field peas. Grown in Canada and northern states to some extent for forage. The peas do not thrive where weather is hot

Field Pea Straw—Residue from threshed field peas used as a feed for livestock. Satisfactory when fed as not over half the roughage along with good legume hay or silage

Total dry matter	90.2%
Digestible protein	3.2%
Total digestible nutrients	42.2%
Nutritive ratio	112.2

Flaxseed and Ground Flaxseed—Seeds from the flax plant—*Linum Usitatissimum*. Very little flaxseed is used directly as feed because of its value for the production of oil although ground flaxseed is satisfactory as a protein supplement in place of linseed meal. It contains only two thirds as much protein as linseed meal but it is one of the richest of feeds in total digestible nutrients

See Linseed Meal	
Total dry matter	93.8%
Digestible protein	21.8%
Total digestible nutrients	108.3%
Nutritive ratio	14.0

Fluorine—An inorganic element found in trace amounts in the animal body which is very toxic when relatively small amounts are consumed. Rock phosphate often contains a toxic amount and must therefore be defluorinated before use as a phosphorus supplement

Fodder—Coarse feed for domestic animals as corn fodder, hay, vegetables

Fodder Corn—Same as Corn Fodder

Forage—Vegetable food of any kind for animals especially that consumed by domestic animals as pasturage. Usually refers to roughage and crops grown primarily for use as roughage

Forage Grass—Any grass used as feed for stock

Fowl Meadow Grass, (*Poa palustris*)—A close relative of Kentucky bluegrass. It grows well on very wet land in the northern states and is well liked by cattle

	<i>Hay</i>
Total dry matter	87.4%
Digestible protein	4.0%
Total digestible nutrients	46.6%
Nutritive ratio	110.7

Gama Grass—A tall coarse grass used for forage, native of America.

	Hay
Total dry matter	88.2%
Digestible protein	2.1%
Total digestible nutrients	39.4%
Nutritive ratio	1:17.8

Garlic—An herb with a bulbous root, which has a strong scent and pungent flavor, and is composed of a number of smaller bulbs called cloves. Not a desirable feed constituent as it imparts objectionable flavors to milk.

Gluten Feed—See Corn Gluten Feed.

Gluten Meal—See Corn Gluten Meal.

Goober—See Peanut.

Grain Sorghum—See Sorghum, (2).

Grass Silage—Silage is now being made from alfalfa, soybeans, sudan grass, clover, timothy, oats, canary grass and other crops usually grown for hay. Such silage is commonly called grass silage or hay crop silage. This silage is often made with preservatives like acids or with products like molasses, whey concentrate, green corn, or green sorghum which ferment to form acid.

Grass Sorghum—Any leafy sorghum as Sudan grass, used especially for hay, silage or pasture.

Greasewood, (*Sarcobatus*, spp.)—See Sagebrush.

Grit—Grain, especially maize, oats, or wheat, coarsely ground.

Groats—Dried grain, hulled and often broken or crushed; in oats, the edible portion of the kernel.

Ground Corn—See Corn Meal.

Ground Corn and Oats, Ground Feed—See Corn-and-Oat Feed.

Guinea Grass, (*Panicum maximum*)—Tropical grass grown in this country only along the coast from Florida to southern California. It is used chiefly for pasture, but is often fed as a green soiling crop.

	Pasture
Total dry matter	26.8%
Digestible protein	0.8%
Total digestible nutrients	13.8%
Nutritive ratio	1:16.3

Hay—Grasses or legume plants, more or less matured, cut and dried for use as fodder. The primary object in haymaking is to reduce the water content of the green plants enough so that the hay can be safely stored in mass without becoming moldy or undergoing pronounced fermentation which sometimes leads to spontaneous combustion. Well cured hay is grass cut at that stage of maturity where it gives maximum amount of nutrients and palatability, and is carefully dried so as to avoid loss of these nutrients through bleaching in the hot sun or by leaching in the rain.

Hegari—A grain sorghum resembling *kafir*. The whole plant with its many broad leaves and sweet, juicy stalks with erect heads is used for forage. It is popular in the western part of the sorghum belt.

	Fodder, Hay
Total dry matter	86.3%
Digestible protein	3.2%
Total digestible nutrients	52.4%
Nutritive ratio	1:15.4

Hempseed Oil Meal—A by-product in producing oil from the seed of hemp (*Cannabis sativa*). It contains 31% protein, is high in fiber and is lower in total digestible nutrients than good legume hay. This meal is not palatable unless mixed in very small quantity with well-liked feeds, and may be harmful to cattle.

Total dry matter	92.0%
Digestible protein	25.1%
Total digestible nutrients	43.2%
Nutritive ratio	1:0.7

Herdsgrass—Timothy; after John Herd who found timothy growing in New Hampshire in 1700.

Hominy—A dry maize product made by removing the hull and breaking the kernel into particles of even size coarser than in corn meal.

Hominy Chop—See Hominy Feed.

Hominy Feed—A by-product in the manufacture of hominy grits and corn meal consisting of the hulls and germ which are removed from the kiln-dried corn kernel together with some fine starch from the outside starch layer. This feed is slightly higher in protein than corn, high in carbohydrates and fats, more bulky than corn but very palatable. It retains its sweetness and keeps better than corn meal. Also known as Hominy Meal and Hominy Chop.

Total dry matter	89.9%
Digestible protein	7.5%
Total digestible nutrients	83.9%
Nutritive ratio	1 10.2

Hominy Meal—See Hominy Feed

Hulled Oats—See Oat Meal

Hydrolyzed Sawdust—Sawdust heated with dilute acid under pressure to increase the digestibility. Usually fed to dairy cows as part of a concentrate mixture. Used only during a feed famine.

Hydrolyzed Straw—Straw heated under pressure with dilute alkali or dilute acid to increase the digestibility and nutritive value. An expensive method used only when there is an extreme shortage of stock feed.

Iodine—An element present in feeds which helps prevent goiter in livestock.

Irradiated Yeast—A commercial product rich in vitamin D produced by the irradiation of yeasts with ultra violet light. Often used as a vitamin D supplement.

Japanese Cane—A slender-stemmed variety of common sugar cane (*Saccharum Officinarum*), sometimes grown for forage.

Florida reports good pasture from this forage crop if it is not overgrazed.

Fodder	Silage	Roughage
Total dry matter		
89.0%	21.9%	28.2%
Digestible protein		
0.7%	0.5%	0.4%
Total digestible nutrients		
55.3%	13.3%	17.1%
Nutritive ratio		
1.780	1.256	1.418

Jerusalem Artichoke—A perennial American sunflower widely cultivated and often occurring as an escape. Also the tuber of the plant which is cooked and eaten as a vegetable and is used as a feed for livestock. The plant is one of the remains of American Indian agriculture.

Johnson Grass (*Sorghum halepense* or *Andropogon halepensis*)—A close relative of Sudan grass. It is a valuable southern grass with vigorous creeping rootstocks. As a hay it is similar in feeding value to timothy. It can be cut once a month as a soiling crop. Because of its vigorous root growth it has become a pest to the cotton farmer.

	Pasture	Hay
Total dry matter	25.0%	90.2%
Digestible protein	2.5%	2.9%
Total digestible nutrients	15.6	50.3%
Nutritive ratio	1.52	1.163

June Grass—See Blue Grass

Kafir—A stout stemmed short jointed broad leaved drought resistant plant of the grain sorghum group grown extensively for use as grain and forage in the less arid sections of the sorghum belt. Earlier maturing dwarf varieties are suitable for the drier western regions of the U. S. The erect compact cylindrical heads carry the small egg shaped seeds which usually are ground before they are fed to dairy cattle.

	Grain	Pasture
Total dry matter	89.8%	23.6%
Digestible protein	8.9%	1.2%
Total digestible nutrients	81.6%	14.4%
Nutritive ratio	1.82	1.110

Kale, *Brassica oleracea*, var. *Acephala*—A plant similar to cabbage but does not form heads. It is grown extensively only in the northern Pacific Coast district where the variety Thousand Headed Kale is considered the best. Fall and winter soiling crop for dairy cows. Kale should be fed after milking to avoid tainting the milk.

	Pasture
Total dry matter	11.8%
Digestible protein	1.9%
Total digestible nutrients	8.0%
Nutritive ratio	1.32

Kaoliang—An early maturing grain sorghum with loose erect seedheads grown in the northern sections where other types will not mature. The slender pithy stalks have few leaves and the forage is of poorer quality than that from most of the other grain sorghums.

	Grain
Total dry matter	89.9%
Digestible protein	8.2%
Total digestible nutrients	81.7%
Nutritive ratio	1.90

Kelp—A coarse heavy brown rubbery dried sea plant found in the Pacific Ocean. It is high in potash and is also a source of iodine for which it is most used at present.

Total dry matter	91.3%
Digestible protein	2.5%
Total digestible nutrients	28.9%
Nutritive ratio	1.106

Kentucky Bluegrass, (*Poa pratensis*)—A persistent, long-lived, sod-forming grass 18 to 24 inches high, noted for its keel-shaped leaf tips, open pyramidal panicle, rhizomatous character, and its brilliant green color during periods of lush growth. Dormant during the summer, it makes its best growth during the spring and fall. The grass is widely used as a lawn and turf grass and to a lesser extent for pasturage and hay. It is found in both Europe and America, but reaches its finest development in the central United States, especially in Kentucky.

	Pasture
Total dry matter	30.2%
Digestible protein	4.1%
Total digestible nutrients	20.7%
Nutritive ratio	1:4.0

Kidney Beans—See Field Bean Feed.

Kidney Bean Straw—See Field or Kidney Bean Straw.

Kohlrabi, (*Brassica Caulorapa*)—A species of the cabbage plant, in which the stem becomes greatly enlarged, fleshy, and turnip-shaped, and is eaten like cauliflower. Kohlrabi does not flavor milk when fed to dairy cows.

	Pasture
Total dry matter	9.0%
Digestible protein	1.5%
Total digestible nutrients	7.0%
Nutritive ratio	1:3.7

Kudzu, (*Pueraria thunbergiana*)—A long-lived, non-hardy coarse-vined perennial legume useful for pasture and hay production in the South, and especially noted for soil erosion control.

	Hay	Pasture
Total dry matter	89.8%	30.6%
Digestible protein	10.2%	4.2%
Total digestible nutrients	49.3%	19.9%
Nutritive ratio	1:3.8	1:3.7

Laxative Feeds—The most desirable feeds for milk production are those that are slightly laxative in effect. Among these are the succulent feeds, legume hays, linseed meal, wheat bran and molasses.

Legumes—Plants of the family *Leguminosae* which bear seeds in pods. Plants such as clover, alfalfa, rowpeas, soybeans, etc. that have nodules on their roots containing bacteria which can take nitrogen from the air. Legumes are generally rich in both protein and mineral matter and make ex-

cellent roughage for dairy cattle, or are used as a green-manure crop. A leguminous plant, especially one grown as a forage or green-manure crop, as any of various clovers, soy beans, alfalfa, etc.

Botanically, a superior one-celled monocarpellary fruit usually dehiscent into two parts, having the seeds attached along the ventral suture; commonly called pod, and restricted to fruits of the pea family.

Legume Chaff—See Legume Straw.

Legume Straw—The part of ripe legumes fed to stock after the legumes have been threshed for seed. It contains less protein, is lower in total digestible nutrients and is higher in fiber than legume hay. For best results, legume straw should be fed with good legume hay or silage. It is also known as Legume Chaff. See Alfalfa and Clover Straw, Field Pea Straw, Kidney Bean Straw, Lespedeza Straw, Soybean Straw.

Lentil—An annual plant grown for its lens-shaped seeds, which are cooked like peas or beans and are also ground into meal. The leafy stalks are also used for fodder.

Lespedeza, (*Lespedeza striata*)—sometimes known as Japan clover. An annual non-winter hardy, upright or spreading leguminous plant 6 to 18 inches high and with small, freely branched stems. The plant finds good use as a soil improvement, green manure, or hay crop in the Southeast and as far west as the Mississippi River.

	Hay	Pasture
Total dry matter	89.1%	25.0%
Digestible protein	6.4%	2.9%
Total digestible nutrients	46.4%	14.2%
Nutritive ratio	1:6.3	1:3.9

Korean Lespedeza, (*Lespedeza stipulacea*)—An early variety of lespedeza grown as far north as central Ohio, Indiana and Michigan. It resembles alfalfa hay in feeding value.

	Hay
Total dry matter	89.1%
Digestible protein	6.4%
Total digestible nutrients	46.4%
Nutritive ratio	1:6.3

Lespedeza Sericea—A perennial species of lespedeza, taller and with coarser stems than the annual species, of some value as a perennial pasture and hay crop but not as good as annual varieties, and sometimes very unpalatable due to its high tannin content.

	<i>Hay</i>
Total dry matter	89.2%
Digestible protein	4.1%
Total digestible nutrients	41.2%
Nutritive ratio	1.90

Lepedeza Straw—A substitute for good soy bean hay, although not as palatable (See Legume Straw)

	<i>Hay</i>
Total dry matter	90.0%
Digestible protein	1.2%
Total digestible nutrients	44.3%
Nutritive ratio	1.35.9

Limestone—A rock consisting chiefly of calcium carbonate and yielding lime when burned. It sometimes contains magnesium carbonate also. Finely ground limestone can be used as a calcium supplement for dairy cows if the roughage fed is inadequate in that mineral. It is sometimes included in the grain ration at the rate of about 20 lb per ton, or may be included in a suitable mineral mixture and fed free choice.

Limestone, Ground — A common calcium supplement which is usually cheap and readily available. The calcium content varies with the type of limestone used and its value should be calculated accordingly (See limestone).

Linseed—The seeds of flax, flaxseed.

Linseed Cake—The solid mass or cake which remains when oil is expressed from flax seed. Ground linseed cake is called linseed meal, or oil meal. See Linseed meal.

Linseed Meal—A protein rich concentrate feed which is prepared from the residue after the linseed oil is extracted from the flaxseed. It is produced under two processes, known as the old and the new. It is a valuable feed for dairy cattle, because it is laxative, palatable, and a very good "conditioner."

<i>Digestible nutrients—old process (oil pressed out by hydraulic pressure)</i>	
Total dry matter	91.0%
Digestible protein	30.5%
Total digestible nutrients	75.3%
Nutritive ratio	1.15

<i>Digestible nutrients—new process (oil extracted by a solvent)</i>	
Total dry matter	91.0%
Digestible protein	30.7%
Total digestible nutrients	70.3%
Nutritive ratio	1.15

Linseed Meal, (New Process)—In the new process generally termed the solvent process the seed is cracked, heated moderately and rolled in thin flakes, which pass into an extracting tower where the oil is extracted by volatile solvents. The residue, now known as linseed meal (new process) is then heated and dried to remove all traces of the fat removing solvent.

This process is much more efficient than the hydraulic or expeller process. Consequently new process linseed meal is lower in fat and not as valuable a feed as old process linseed meal.

Linseed Meal, (Old Process)—In the expeller process, formerly known as "old process" the seed is cracked, dried, and then heated by steam pressure equipment. The oil is expelled in hydraulic presses enough heat is developed by friction which results in cooking the meal thoroughly. The accompanying residue, now in flake form is ground into meal or run through machines which deliver it in the form of pellets.

Lucerne—See Alfalfa.

Maintenance Requirements—The nutrients required by an animal merely to maintain essential life processes and the integrity of its body, when doing no work and yielding no product.

Maize—Commonly known as corn. See Corn.

Malt Sprouts—A by product in the manufacture of beer. The feed is made from the small dried roots after the barley grain has been processed to convert the starch into malt sugar. Malt sprouts are bitter and unpalatable and only about 10-15% should be used in a concentrate mixture for dairy cows. If fed in too large amounts the milk will taste bitter. Malt sprouts absorb moisture readily and therefore are used largely in molasses mixed feeds.

Total dry matter	92.6%
Digestible protein	20.3%
Total digestible nutrients	70.9%
Nutritive ratio	1.25

Mangels—A popular root crop widely used as a succulent feed for dairy cattle, especially in Europe. Also called Mangel wurzel.

Manihot Meal—See Cassava Meal.

Mash—A mixture of ground feeds used whether moistened or dry, for feeding livestock.

Meadow Fescue, (*Festuca elatior*)—A perennial grass for permanent pastures usually sown in mixture with other grasses because the seed is high-priced. It thrives best on rich moist land, especially in the mid-west, and furnishes pasture from early spring to late fall.

	Pasture
Total dry matter	30.5%
Digestible protein	1.6%
Total digestible nutrients	18.5%
Nutritive ratio	1:10.6

Meadow Foxtail, (*Alopecurus pratensis*)—A long-lived, early maturing, perennial grass, growing in loose tufts, generally 3 to 6 feet high. The natural habitat is cool and moist climates. The grass is generally used as a pasture crop.

Meal—Coarsely ground and unbolted grain, especially cereal grain; hence, a similar product made by grinding other seeds, or nuts, after removal of part of the oil, or any dried food material, as meat or fish.

Meat and Bone Meal, Meat and Bone Scraps, Meat Meal, Meat Scraps—See Dry Rendered Tankage.

Mesquite and Tornillo—Large leguminous shrubs or small trees common in parts of the southwestern states. Their pods and seeds, rich in sugar, are eaten by stock. Seeds very small and hard must be finely ground to be digestible.

	Pasture
Total dry matter	94.0%
Digestible protein	11.7%
Total digestible nutrients	71.6%
Nutritive ratio	1:5.1

Middlings—See Wheat Standard Middlings.

Millet—Rapid-growing, hot-weather annuals of many varieties. They are used for forage in the United States, and as emergency crops when drought may destroy the regular grain or hay crop. The millets yield from 1 to 2 tons per acre of fairly palatable hay, if cut when the blossoms appear. They are not difficult to cure and harvest. See Foxtail, Japanese, Pearl, and Hog Millets.

Broom Corn Millet—See Hog Millet.

Cat-Tail Millet—See Pearl Millet.

Common Millet—See Foxtail Millets.

Foxtail Millets, (*Setaria Italica*, spp.)—Grown for hay crops in the northern dry farming regions of the United States and elsewhere as catch crops and forage. Foxtail millets include the (1) common millet—earliest and most drought-resistant; (2) Hun-

garian millet—purple-seeded, shorter-stemmed, and less drought-resistant; and (3) German millet—heavier yielder, later-maturing, and making poorer quality hay—See Millets.

	Hay
Total dry matter	87.6%
Digestible protein	4.9%
Total digestible nutrients	50.0%
Nutritive ratio	1:9.2

German Millet—A variety of Italian or Foxtail millet with large drooping heads. See Foxtail Millets.

Golden Millet—Italian millet.

Hog Millet, (*Panicum miliaceum*)—The common grain millet used for human food in Europe and Asia since prehistoric times. It is grown in the northern plains of the United States chiefly as a catch crop where the season is too short for the grain sorghums. The plant has wide, hairy leaves and large seeds growing in spreading heads. The ground seed makes a satisfactory stock feed. Also called Proso and Broom-Corn Millet.

	Pasture
Total dry matter	24.7%
Digestible protein	1.2%
Total digestible nutrients	15.6%
Nutritive ratio	1:12.0

Hungarian Millet—See Foxtail Millets.

Italian Millet—See Foxtail Millet.

Japanese Millet, (*Echinochloa Icutementa*)—A rank-growing variety of common barnyard grass, better adapted to cool, wet soils than foxtail millets or Sudan grass. This tall, coarse millet may be used as forage, hay or silage. It is extravagantly called "Billion-dollar grass." See Millets.

	Pasture
Total dry matter	21.3%
Digestible protein	1.7%
Total digestible nutrients	13.2%
Nutritive ratio	1:6.8

Pearl Millet, (Cat-tail millet), (*Pennisetum glaucum*)—A soiling or temporary pasture crop grown to some extent in the South and Southwest. It is being displaced by the sorghum where they can be grown, which give heavier yields and better feeding values.

	Hay	Pasture
Total dry matter	87.2%	20.6%
Digestible protein	4.2%	1.5%
Total digestible nutrients	49.8%	12.8%
Nutritive ratio	1:10.9	1:8.8

Pencillaria Millet—See Pearl Millet.

Proso Millet—See **Hog Millet**

Millfeed—Any of the by products of the milling industry used for feeding live stock

Milk Replacements for Raising Calves—Any of a number of commercially prepared milk substitutes which have gained considerable popularity especially in Class I milk market areas where they are frequently used to replace all or part of the whole milk normally used for raising calves

Milo—An early maturing, drought resistant grain sorghum with pithy stalks containing small amounts of juice sparsely leaved and with rather large seeds borne in short thick heads. As a grain it equals kafir in feeding value but not as forage

Total dry matter	89.0%
Digestible protein	8.1%
Total digestible nutrients	79.4%
Nutritive ratio	1.83

Mixing Dairy Rations—The process of formulating and of blending together ingredients to produce concentrate mixtures suitable for dairy cattle. May be either home mixed or commercially mixed

Molasses—Molasses as used by dairymen is a by product from the manufacture of sugar and may come from either cane or beets. The molasses from cane is known as "blackstrap", that from beets as beet molasses. These products are essentially energy feeds. They are crude syrups both of which (and especially beet molasses) are quite laxative and generally recommended only in quantities of from 2 to 3 lb per animal daily. The customary way of feeding on the farm is to dilute the molasses with water and sprinkle it over the feed. Many commercial feeds contain molasses

	Beet	Black strap
Total dry matter	89.5%	73.4%
Digestible protein	4.4%	0.6%
Total digestible nutrients	69.8%	53.7%
Nutritive ratio	1.128	

Molasses Feeds—Mixed feeds of high or low quality to which molasses has been added to increase palatability and to add easily digested carbohydrate. Molasses makes a low-grade mixture more palatable but also makes a poor feed appear of greater value than it is

Monantha Vetch, (*Vicia monantha*)—See **Vetch**

Mung Bean, (*Phaseolus aureus*)—This hay resembles cowpea but is coarser and somewhat more stemmy. Trials indicate a good annual hay crop, particularly for southern dry sections. It produces fair yields on poor soil where alfalfa does not thrive

	Hay
Total dry matter	90.3%
Digestible protein	6.5%
Total digestible nutrients	49.8%
Nutritive ratio	1.67

Napier Grass, (*Pennisetum purpureum*)—Tropical grass that grows 6 to 12 feet tall in clumps of 20 to 200 stalks about one inch in diameter. It grows in the Gulf States and is an excellent soiling crop for dairy cows. It also makes good silage

	Green	Silage
Total dry matter	18.9%	26.8%
Digestible protein	1.4%	0.3%
Total digestible nutrients	12.1%	11.6%
Nutritive ratio	1.76	1.577

Natal Grass, (*Tricholena rosea*)—An annual grass grown in the Gulf section. It is well adapted to poor sandy soils and produces good late summer and fall pasturage and good hay

	Hay
Total dry matter	90.2%
Digestible protein	3.1%
Total digestible nutrients	48.0%
Nutritive ratio	1.145

National Research Council Standard—A subcommittee of the National Research Council has developed tables of recommended nutrient allowances for dairy cattle. The essence of this standard is published in the Reference section of this book, P. 306

Emphasis is placed on the digestible protein and total digestible nutrients but in addition it also includes allowances for calcium, phosphorus, carotene and vitamin D

Navy Beans—Sometimes called **Field Beans**. See **Field Bean Feed**

Oats, (*Avena sativa*)—A leading grain crop in the United States fed in large amounts to dairy cattle both as a whole grain and as a by product. In the milling of oat products for human food. As a feed for cows and other stock, oats are very palatable and nearly always ground

Total dry matter	90.2%
Digestible protein	9.1%
Total digestible nutrients	70.1%
Nutritive ratio	1.65

Oat Clippings—See **Clipped Oats By Product**

Oat Feed—A by-product of the oat milling industry. A finely ground low-grade feed consisting of about 16% oat middlings and shorts and about 84% oat hulls and about equal in feeding value to average quality timothy hay. It is high in fiber low in protein and low in total digestible nutrients. Also called oat mill feed.

Total dry matter	93.6%
Digestible protein	2.7%
Total digestible nutrients	36.8%
Nutritive ratio	1:12.6

Oat Grass—A bunch type, hardy, upright, tall grass, oatlike in appearance. It produces much fair quality hay, doing well on light sandy and gravelly land of the central and northern states.

	Hay
Total dry matter	88.1%
Digestible protein	4.9%
Total digestible nutrients	47.3%
Nutritive ratio	1:8.7

Oat Groats—The polished kernels of high-grade oats from which the hulls have been removed in hulling machines prior to their manufacture into oat meal and other foods.

Total dry matter	90.4%
Digestible protein	14.6%
Total digestible nutrients	91.9%
Nutritive ratio	1:5.3

Oat Hay—Oats cut in the milk or dough stage and cured make a palatable nutritious hay, especially valuable in the semi-arid districts. The later cut with higher grain development is more nutrititious.

Total dry matter	88.1%
Digestible protein	4.9%
Total digestible nutrients	47.3%
Nutritive ratio	1:8.7

Oat Hulls—A by-product in the manufacture of oatmeal. It is higher in fiber and lower in protein and nitrogen-free extract than oat mill feed.

Total dry matter	92.8%
Digestible protein	1.5%
Total digestible nutrients	31.7%
Nutritive ratio	1:20.1

Oat Meal—Oat groats or kernels with hulls removed and ground into meal. Oat meal is low in fiber and contains more fat than corn grain and has 16-17% protein. It is highly nutritious for such stock as young pigs and calves. Also called *Hulled Oats*.

Total dry matter	90.8%
Digestible protein	11.5%
Total digestible nutrients	91.4%
Nutritive ratio	1:5.3

Oat Mill Feed—See Oat Feed.

Oats and Pea Soiling Crop—Oats and peas are often sown together as a spring soiling crop for feeding dairy cows. They are about the best early annual crop for this purpose. See Oats and Pea Silage.

Oil Cake—The solid mass, or residue, left after extracting most of the oil from seeds of cotton, hemp, flax, soybeans, etc., or dried coconut meat, etc., used especially after grinding (and then called oil meal) as a stock feed and some kinds as fertilizer; specifically, linseed, or flaxseed, cake.

Oil Meal—See Linseed Meal.

Open Formula Feeds—Commercially mixed feeds, the formulae for which are made public, i.e. the amount of each ingredient in the feed is stated on the label. Some cooperatives make use of this method; however, most commercial feeds are made with "closed formulas," i.e. ingredients listed as required by law but not the amounts of each.

Orchard Grass, (*Dactylis glomerata*) — A long-lived, bunch-type drough resistant perennial pasture grass, producing an abundance of basal leaves and many seeds on a distinctive type inflorescence. It is a high yielder of slightly above average forage used most extensively in the southern parts of the corn belt. It is richer than most grasses in phosphorus and calcium. Grown in combination with a legume, it is one of the grasses that is the basis of high producing semi-permanent pastures. Responds well to heavy fertilization, particularly nitrogen. Known as Cocksfoot in England.

	Pasture	Hay
Total dry matter	23.9%	88.6%
Digestible protein	3.2%	3.9%
Total digestible nutrients	15.9%	47.8%
Nutritive ratio	1:4.0	1:11.3

Packing Plant By-Products—The by-products of the meat packing industry used for stock feeding. These feeds are high in protein, and rich in calcium and phosphorus, making them especially valuable for swine and poultry. See Digester Tankage, Dry-Rendered Tankage, Meat and Bone Meal, Steamed and Raw Bonemeal, and Blood Meal.

Palm-Kernel Oil Cake—A by-product from the production of oil from the seed kernels of certain oil palms (*Elaeis*, spp.). It usually contains slightly more protein, fat and fiber and total digestible nutrients than wheat bran. Tends to produce firm butter when fed to dairy cattle. Also called *Palm-Kernel Oil Meal*.

	High in	Low in
	fiber	fiber
Total dry matter	91.4%	87.7%
Digestible protein	15.4%	14.4%
Total digestible nutrients	76.5%	71.7%
Nutritive ratio	1.40	1.40

Palm Kernel Oil Meal—See Palm kernel Oil Cake

Palm Middlings—A by product in the tin plate industry. Wheat middlings are used to remove the excess of palm oil with which the tin plate has been covered in the preparation. The mixture of oil and middlings is fed chiefly to swine and is somewhat lower in feeding value than wheat middlings. On account of the high fat content—7% to 10%—only 20-25% should be used in the ration.

Total dry matter	93.4%
Digestible protein	13.4%
Total digestible nutrients	82.5%
Nutritive ratio	1.52

Para Grass, (*Panicum purpurascens*)—A perennial tropical grass adapted only to the extreme southern part of the United States. The hay is coarse but of very good quality if cut when 3-4 feet high.

	Pasture	Hay
Total dry matter	27.8%	90.2%
Digestible protein	1.0%	1.9%
Total digestible nutrients	14.9%	41.6%
Nutritive ratio	1.139	1.209

Parsnips (*Pastinaca sativa*)—A popular root crop with dairymen on the islands of Jersey and Guernsey. They are rarely grown in the United States for stock feeding.

Total dry matter	16.6%
Digestible protein	1.2%
Total digestible nutrients	14.8%
Nutritive ratio	1.113

Pea—The round edible seed rich in protein borne by a leguminous vine varieties are countless.

Pea Cannery Waste—See Pea Vine Silage

Pea Feed—A by product from the manufacture of split peas for human food. It consists of shrunken broken or otherwise damaged peas, pea bran germ and broken particles from the seed. It is fed to dairy cows as part of a concentrate mixture.

Total dry matter	90.0%
Digestible protein	14.5%
Total digestible nutrients	77.9%
Nutritive ratio	1.44

Peanuts, (*Arachis hypogaea*)—An important southern legume used largely for human food. A vining plant with nuts growing

under ground. As a feed for dairy cattle see Peanut Oil Meal and Whole-Pressed Peanuts and Peanut Hay. Also called Earth Nut or Goober.

Total dry matter	91.6%
Digestible protein	27.7%
Total digestible nutrients	137.9%
Nutritive ratio	1.40

Peanut Hay—The cured forage of the peanut plant after threshing. It is fed like other legume hays but is lower in protein content. When well cured and of good quality it is about equal to alfalfa or cow pea hay in feeding value.

Total dry matter	90.6%
Digestible protein	5.4%
Total digestible nutrients	47.3%
Nutritive ratio	1.78

Peanut Oil Meal—A high quality protein feed for dairy cows made from bulled peanut residue after the oil has been extracted.

Total dry matter	93.0%
Digestible protein	47.6%
Total digestible nutrients	77.3%
Nutritive ratio	1.06

Peanut Skins—A feed made from the thin red brown coverings of the peanut kernels with some of the germ and broken bits of the kernel. They are a by product of the peanut food industry and are used chiefly in certain mixed feeds.

Total dry matter	93.8%
Digestible protein	41.1%
Total digestible nutrients	61.5%
Nutritive ratio	1.140

Whole Pressed Peanuts—Ground residue including the shells after part of the oil has been extracted from whole peanuts. It is also known as Unhulled Peanut Oil Feed.

See Peanut Oil Meal	
Total dry matter	93.0%
Digestible protein	47.6%
Total digestible nutrients	77.3%
Nutritive ratio	1.06

Pineapple Bran or Pulp—A by product of the Hawaiian canneries exported to the United States. The dried outer shells and sometimes the cores of pineapples with or without the addition of cane molasses. Resembles dried beet pulp in composition and when fed to dairy cows should not form more than $\frac{1}{4}$ to $\frac{3}{8}$ of the concentrate mixture. Also called Dried Pineapple Pulp.

Total dry matter	88.6%
Digestible protein	0.8%
Total digestible nutrients	63.8%
Nutritive ratio	1.788

Pinto Beans—See Field Bean Feed.

Pod Corn—A type of Indian corn having each kernel, as well as the whole ear, enclosed in husks, also called husk corn.

Poppy Seed Oil Meal, (*Papaver somniferum*)—A by-product from the production of oil from the opium poppy seed. It is high in protein but should be fed in small amounts to dairy cows because its alkaloids are apt to decrease the fat percentage of milk. Not of great importance in the U. S.:

Total dry matter	89.2%
Digestible protein	30.4%
Total digestible nutrients	62.3%
Nutritive ratio	1:1.0

Potatoes, (*Solanum tuberosum*)—A well known root crop grown mostly for human food in the United States but fed to stock in limited amounts as a substitute for grain or other feeds when the market price is unusually low. Potatoes are comparatively high in dry matter and starch but are low in protein and should be fed with other protein-rich feeds, since they are worth only 22-25% per 100 lb. as much as grain in feeding value.

Total dry matter	21.2%
Digestible protein	1.3%
Total digestible nutrients	17.4%
Nutritive ratio	1:12.4

Potato Pulp, Dried—A dried by-product of potato starch manufacture. It is the dried residue of ground whole potatoes after the water extraction of starch. It is said to be the equal of hominy when fed at the level of 22½% of the dairy cow's grain ration, and to be palatable and relished by dairy cattle. Because of its low moisture content it can be stored for about a year under normal farm conditions. Dried potato pulp may be fed separately much the same as citrus and beet pulp are now fed. It mixes readily with other concentrates and may be fed as a mixed ration. It is most successfully fed in dry form and should not be soaked. The chemical analysis shows the following ingredients:

	Average Analysis	Average Digestible Nutrients
Protein	7.69%	5.98%
Fat	.39%	.25%
Fiber	6.14%	3.91%
Nit.-Free Extract	70.27%	68.85%
Minerals	3.20%	
Water	12.31%	
Total Digestible Nutrients		78.97%

Prairie Hay—Native hay of the prairies of the Midwestern States, the exact value of which depends upon the grasses composing it. Generally speaking, it is about equal to timothy in nutritive value for dairy cows. This hay is relatively low in protein and in most cases low in minerals.

Total dry matter	91.0%
Digestible protein	3.7%
Total digestible nutrients	45.7%
Nutritive ratio	1:11.4

Provender—A mixture of corn and oats extensively used in eastern and southern states for the feeding of dairy cattle and horses. The mixture is variously called provender, corn and oat feed, corn and oat chop, ground corn and oats, ground feed. There is wide variation in its composition. See Corn-and-Oat Feed.

Pumpkins, (*Cucurbita pepo*)—Not valuable as a dairy cattle feed except as a relish or appetizer. They contain 10.4% dry matter and are low in feeding value. One ton of pumpkins equals about 333-400 lb. mixed hay or 800 lb. corn silage in feeding value for dairy cows.

Total dry matter	10.4%
Digestible protein	1.3%
Total digestible nutrients	9.0%
Nutritive ratio	1:5.9

Quack Grass, (*Agropyron repens*)—Because of the creeping, matty habit of its roots, it is one of the most common and destructive weeds of the North Temperate Zone and hard to eradicate. It makes good pasturage and when cut early in bloom it makes hay said to be equal to timothy. It is also known as Witch or Couch Grass.

	Pasture	Hay
Total dry matter	25.0%	89.0%
Digestible protein	3.0%	2.5%
Total digestible nutrients	16.8%	40.3%
Nutritive ratio	1:4.6	1:15.1

Range Grass—Grasses native to the plains area of North America.

Rape—An annual herb of European origin, but grown in the United States as a swine and sheep forage crop, as a cover in orchards, etc. Its seeds yield rape oil and are a food for birds.

Rape Seed Oil Meal—A by-product in the production of oil from various kinds of rape seed (*Brassica*, spp.). Often injurious to cattle if fed in large amounts. This meal has a sharp, bitter, mustard-taste and therefore should be mixed with better-tasted feeds. Sometimes called Colza Oil Meal.

Total dry matter	89.5%
Digestible protein	28.5%
Total digestible nutrients	68.1%
Nutritive ratio	1.14

Red Shorts—See Wheat Brown Shorts

Red Top, (*Agrostis alba* or *palustris*)—A grass with a wider range of adaptability to climatic and soil conditions than any other cultivated grass. Ranks second to bluegrass in importance in U S as a pasture grass and like it forms a dense turf. In New England it is one of the chief hay grasses. It is not so palatable as timothy and therefore is usually sown with it and with clover.

	Pasture	Hay
Total dry matter	26.0%	91.2%
Digestible protein	3.6%	3.3%
Total digestible nutrients	17.5%	49.3%
Nutritive ratio	1.39	1.139

Reed Canary Grass, (*Phalaris arundinacea*)—A leafy perennial bunch type grass adapted to wet lands and also drier upland soils. A tall growing leafy grass its long life and high yield making it suitable as long term pasture or hay plant. A native of the temperate regions in North America Europe and Asia. Volunteers readily and may become a pest.

	Hay	Pasture
Total dry matter	91.1%	25.0%
Digestible protein	4.9%	3.0%
Total digestible nutrients	45.1%	15.3%
Nutritive ratio	1.82	1.41

Rescue Grass, (*Bromus Catharticus*)—A temporary winter pasture grass on fertile land in southern states. It is also used for hay. It usually behaves as a winter annual in the south.

	Pasture	Hay
Total dry matter	28.9%	90.2%
Digestible protein	3.9%	5.0%
Total digestible nutrients	20.2%	50.8%
Nutritive ratio		1.92

Rhodes Grass, (*Chloris gayana*)—A native of South Africa drought resistant perennial adapted only to Florida a narrow strip along the Gulf Coast and westward to southern California. With irrigation it grows on soil too alkaline for other crops and is the best hay grass in tropical countries.

	Pasture	Hay
Total dry matter	2.3%	89.0%
Digestible protein	1.1%	2.6%
Total digestible nutrients	15.1%	51.4%
Nutritive ratio	1.127	1.188

Rhode Island Bent, (Colonial Bent), *Agrostis vulgaris* or *tenuis*—A common pasture grass in New England and eastern New York southward to Virginia, and westward to the Pacific slope. It grows on soils low in lime and poor in fertility.

Total dry matter	29.4%
Digestible protein	4.2%
Total digestible nutrients	19.7%
Nutritive ratio	1.37

Rice (*Oryza Sativa*)—One of the world's most important cereals. One of the essential foods of oriental people. In the U S it is grown largely in Louisiana Arkansas Texas and California. It is essentially a human food and only the off-grade is used for livestock feed. For dairy cows ground rough rice is said to be about equal to ground corn.

Rice Bran—A product obtained by milling rice used as a stock feed. It consists of the outer part of the kernels the germs and a small amount of hulls.

Total dry matter	90.8%
Digestible protein	8.4%
Total digestible nutrients	67.4%
Nutritive ratio	1.70

Rice Hulls—Most authorities quote rice hulls as of very low value as a feed since they contain practically no protein and only about one fourth total digestible nutrients as wheat straw.

Total dry matter	92.0%
Digestible protein	0.1%
Total digestible nutrients	9.9%
Nutritive ratio	1.98.0

Rice Meal—Rice meal generally means ground brown rice after the hulls have been removed. Sometimes the term is applied to entire ground rice including the hulls. It is considered about equal to corn for stock feeding.

Roots—Mangels rutabagas sugar beets and other root crops sometimes fed to dairy cattle as a source of succulence.

Roughage—A coarse feeding stuff generally high in fiber but low in its percentage of digestible matter as contrasted with that of concentrates. Hay fodder straw and silage are common roughages.

Rowen—The late summer or fall growth of fine-stemmed forage crops which have been previously cut for hay.

Rubber Seed Meal—A by-product from the manufacture of oil from the seed of the Para rubber tree (*Hevea brasiliensis*). The meal is dry, powdery and not very palatable unless fed with better-liked feeds. About equal to linseed meal in feeding value. Not used much in the United States.

Total dry matter	91.1%
Digestible protein	20.4%
Total digestible nutrients	63.4%
Nutritive ratio	1:2.1

Russian Thistle, (*Salsola kali*, var. *tragus*)—A pasture, hay and silage crop used to some extent on the western plains. The mature plants are woody and contain a large amount of alkali and the stems are harsh and prickly. The plants should be cut when in bloom.

	Hay	Pasture
Total dry matter	87.5%	30.0%
Digestible protein	5.8%	2.2%
Total digestible nutrients	37.9%	13.0%
Nutritive ratio	1:5.5	1:4.9

Rutabagas, (*Brassica campestris*)—A root crop well adapted to cool climates, grown extensively in Great Britain and Canada, and valuable as a succulent feed for dairy cows. They are apt to taint cow's milk unless fed only immediately after milking. Also called Swede.

Total dry matter	11.1%
Digestible protein	1.0%
Total digestible nutrients	9.5%
Nutritive ratio	1:8.5

Rye, (*Secale cereale*)—An important cereal crop widely used as a winter cover crop because of its rapid and luxuriant growth and winter-hardiness. Also grown to a limited extent for grain, particularly on sandy soils. It is grown extensively in Europe and is an important crop in northern U. S. This grain may form a part of the dairy cow's ration, although when fed in large quantities it is unpalatable and tends to produce butter of poor quality.

	Hay	Pasture
Total dry matter	90.4%	19.5%
Digestible protein	12.2%	4.0%
Total digestible nutrients	68.1%	12.8%
Nutritive ratio	1:4.6	1:2.2

Rye Bran—A by-product of the rye flour industry consisting of the outer coatings of the rye kernel. The rye bran is usually mixed with the rye middlings and sold on the market as Rye Feed or Rye Middlings; hence, Rye Bran is of little significance.

Rye Grass—A perennial grass with spikelets borne in a zigzag spike. It is used in meadows and pastures.

English Rye-Grass—Similar to Italian rye grass but more winter hardy and longer lived. Not as vigorous in growth habit.

Italian Ryegrass, (*Lolium multiflorum*)—An annual European upright-growing grass much used for hay, turf, soiling, poultry range, temporary pasture, and temporary lawn because of its rapid growth and quick ground cover. It is a short-lived grass not grown extensively in the United States.

The rye grasses are grown in the Pacific Coast states and in the humid southern states. It makes a fine-stemmed, palatable hay and is well liked by stock.

	Hay
Total dry matter	88.6%
Digestible protein	3.4%
Total digestible nutrients	52.3%
Nutritive ratio	1:14.4

Sagebrush, (*Artemisia*, spp.)—Sagebrush, saltbush and greasewood are grown in the arid districts of the West where there is too much drouth and alkali and common salt in the soil for most forage crops.

	Pasture
Total dry matter	51.3%
Digestible protein	5.0%
Total digestible nutrients	26.6%
Nutritive ratio	1:4.3

Sagrain—A strain of shrook sorghum grown in the Delta district of Mississippi. It produces excellent yields of grain and forage.

	Concentrate
Total dry matter	90.0%
Digestible protein	7.4%
Total digestible nutrients	81.6%
Nutritive ratio	1:10.0

Salt, (Amount Recommended)—The salt requirements of dairy cows and heifers usually adequately met by including 1% salt in the grain ration and supplying it free-choice in addition (either in a box or in block form).

Saltbush, (*Atriplex*, spp.)—See Sagebrush.

Screenings—Small, broken or shrunken kernels of grain, wild oats, wild buckwheat, smaller weed seeds, chaff and broken pieces of stem, all finely ground and used as part of concentrate ration for dairy cows. Their value depends upon their grain content.

Shallu—A slender-stemmed grain sorghum with spreading heads, generally rated inferior to other types and not of great importance as feed. It is also known as Egyptian Wheat, California Wheat, and Desert Wheat.

Total dry matter	89.8%
Digestible protein	10.5%
Total digestible nutrients	80.7%
Nutritive ratio	1.67

Shrimp Meal—Meal consisting of dried waste of the shrimp industry. It contains about 46.7% protein and 29.8% minerals and is satisfactory for dairy cows when 10-19% meal is included in a concentrate mixture. Also called Shrimp Bran.

Total dry matter	89.7%
Digestible protein	37.8%
Total digestible nutrients	43.5%
Nutritive ratio	1.02

Shorts—See Wheat Middlings

Show Animals, (Feeding of)—An experienced feeder recommends the following grain ration as desirable for conditioning show animals:

100 lb ground oats
200 lb hominy (ground corn)
100 lb bran
100 lb linseed oil meal
5 lb salt

The amount of this mixture to feed depends of course, on the condition of these animals and the length of the feeding period. Thin animals can be fed all they will clean up readily after having free access to roughage. Animals in better condition should require only enough grain to keep them in good condition. Feeders often follow the practice of feeding show animals grain feed with molasses and sufficient water so the mixture is quite sloppy. This helps to develop a deep body and evidence of good capacity.

These are just general suggestions—most feeders have their own ideas.

Shrook—A grain sorghum, probably a hybrid between kafir and a sweet sorghum. It also resembles darso. See also Sagrain.

SILAGE

Finely cut, green or cured corn fodder which has been preserved by being tightly packed in a silo where it is kept free from air. It undergoes an acid fermentation, which gives it an agreeable flavor and prevents spoiling.

Silage is used as a succulent feed for dairy cattle. Corn, where it thrives is an ideal crop for the silo. Other types extensively used are grass, legume and sorghum silages.

Alfalfa Silage—Alfalfa is frequently used for silage when weather conditions prevent its being made into good hay. Due to its low sugar and dry matter content at the stage of growth when normally ensiled it is usually advisable either to wilt the crop or to add a preservative to insure proper fermentation.

Total dry matter	36.2%
Digestible protein	4.3%
Total digestible nutrients	21.5%
Nutritive ratio	1.40

AI V Silage—A patented method of ensiling forages developed by A. I. Virtanen of Finland. The process consists of adding a mixture of dilute sulfuric and hydrochloric acid to the forage as it is ensiled. The purpose of the acid is to prevent bacterial action, thus preventing spoilage. Skilled attention is needed so that the right amount of acid is added and properly distributed.

U. S. Experiment Stations have shown that the addition of phosphoric acid accomplishes the same result as the AI V acids and in addition adds phosphorus, an essential nutrient and fertilizer.

Corn and Cowpea Silage—Corn and cowpeas make an excellent silage crop in the South. See Corn Silage and Cowpea Silage.

Corn and Soybean Silage—Corn and soybeans make a silage higher in protein but usually lower in total digestible nutrients than silage from well-cared corn grown alone. See Corn Silage and Soybean Silage.

Total dry matter	28.3%
Digestible protein	2.0%
Total digestible nutrients	19.7%
Nutritive ratio	1.89

Corn Fodder Silage—Silage made from cured corn fodder. Water is added to wet thoroughly the dry material as it is packed into the silo, in order to exclude air. It is not as valuable and nutritious as green fodder but is more palatable than dry fodder.

Corn Silage—A feed made from the solid, succulent stem, leaves and ears of corn cut into short lengths and closely packed into a silo, forming a solid mass. Preservation is accomplished by exclusion of air, and fermentation. Corn makes the best silage when it has reached the glazing stage in which the leaves are still green and the ears still tender, while the sugar content is high.

Total dry matter	28.5%
Digestible protein	1.3%
Total digestible nutrients	19.8%
Nutritive ratio	1.142

Corn Stover Silage—One of the less valuable corn silages, more palatable than dry corn stover feed. Its feeding value is not high because it does not contain the corn ear. The cut stover must have water added to promote proper fermentation and preservation. To prevent spoilage it must also be packed thoroughly into the silo to exclude as much air as possible.

Total dry matter	23.7%
Digestible protein	0.6%
Total digestible nutrients	14.0%
Nutritive ratio	1:22.3

Cowpea Silage—Cowpeas when grown with corn or sorghum make good silage. Cowpeas are rich in protein and go well with corn. The corn and sorghum plants also support the pea vine as they grow.

Total dry matter	30.0%
Digestible protein	2.5%
Total digestible nutrients	17.8%
Nutritive ratio	1:5.8

Grass Silage—All kinds of grasses, grown by themselves or with legumes, are now being used successfully for silage. A mixture of grasses and legumes is used extensively. Such crops as wheat or rye and vetch, oats and peas, alfalfa and timothy or brome grass or orchard grass, soybeans and Sudan, and many other such mixtures are being used successfully. When the grass has been allowed to wilt to reduce moisture and is ensiled with mineral acids, ground grains, or molasses, good silage, with about the same feeding value as corn silage, can be made.

Legume Silage, (Alfalfa, clover, oat and pea, etc.)—Silage made from various kinds of legumes. See Alfalfa Silage, Clover Silage, Oat and Pea Silage.

Molasses Silage—An ensiled forage lacking in sugar content to which molasses is added to induce the growth of acid-producing bacteria which are necessary to preserve the forage and thus prevent putrefaction.

Oats and Pea Silage—Silage made from oats and peas cut when oats are in the dough stage and peas are matured. Slightly less valuable than corn silage but sometimes used in the northern states to supplement summer pastures.

Total dry matter	28.4%
Digestible protein	2.0%
Total digestible nutrients	17.5%
Nutritive ratio	1:7.8

Oat and Vetch Silage—A combination of oats and vetch is one of the best silage

crops for dairy cattle in the northern Pacific Coast section, greatly exceeding corn in yield in that district. See Oat Silage and Vetch Silage.

Total dry matter	26.4%
Digestible protein	1.5%
Total digestible nutrients	15.4%
Nutritive ratio	1:9.3

Potato Silage—A mixture of chopped potatoes and dry forage, ensiled and used as a feed for dairy cows. In feeding value it is found to be almost equal to corn silage. Profitable only when potatoes are low in price.

Total dry matter	33.7%
Digestible protein	2.2%
Total digestible nutrients	21.6%
Nutritive ratio	1:8.8

Pea Vine Silage—Made from the discarded pea vines and empty pods from canning factories, it contains more protein than corn silage and is a good feed for dairy cows when properly worked into a balanced ration. Its strong odor does not injure the flavor of the milk if fed after milking.

Total dry matter	24.5%
Digestible protein	1.9%
Total digestible nutrients	14.0%
Nutritive ratio	1:6.4

Sorghum and Cowpea Silage—A combination of sorghum and cowpeas provides silage equal or slightly superior to sorghum grown alone. See Sorghum Silage and Cowpea Silage.

Total dry matter	32.3%
Digestible protein	1.3%
Total digestible nutrients	18.4%
Nutritive ratio	1:13.2

Sorghum and Soybean Silage—Sorghum and soybeans in combination provide a silage equal or slightly superior to sorghum grown alone. See Sorghum Silage and Soybean Silage.

Sorghum Silage—Silage made from sorghum when the seeds are hard and ripe. Water is added if the forage is too dry to pack well. Silage may also be made from immature sorghum which has been withered by drouth. It has a much higher feeding value per acre than dry fodder or sorghum hay, and makes an excellent feed for dairy cattle. It is used extensively in southern states where the sweet sorghum yield is high per acre. In dry areas it is stored in pit or trench silos and can be carried over from year to year.

Total dry matter	21.4%
Digestible protein	0.87%
Total digestible nutrients	15.2%
Nutritive ratio	1.80

Soybean Silage—Green soybeans and corn or sorghum ensiled together to make a silage rich in protein. Used alone, soybeans make good silage when a preservative is added or the crop is wilted. As a rule, soybeans make a better hay than silage if the weather is favorable.

Total dry matter	21.8%
Digestible protein	2.9%
Total digestible nutrients	11.6%
Nutritive ratio	1.40

Sorghum Stover Silage—Silage made from sorghum from which the heads have been removed. See Sorghum Silage.

Sunflower Silage—Silage made from sunflowers and used largely in northern sections where corn does not mature sufficiently for silage or where the corn yield is low. It is generally classed as inferior to corn silage in palatability and nutrient value per acre.

Total dry matter	22.6%
Digestible protein	1.0%
Total digestible nutrients	12.2%
Nutritive ratio	1.12

Sweet Clover Silage, (wilted)—Sweet clover cut in the medium late bloom stage, allowed to wilt in the swath to reduce the water content somewhat, then ensiled. If it dries out too much the silage will mold or heat too much. It makes a satisfactory feed for dairy cows.

Total dry matter	39.9%
Digestible protein	6.0%
Total digestible nutrients	22.5%
Nutritive ratio	1.28

Silage Preservatives and Conditioners—Silage crops, like corn and sorghum, contain enough sugar to produce sufficient quantities of acid in the fermentation process to make good silage. With crops deficient in sugar like grasses and legumes particularly where they are of high moisture content, preservatives and conditioners have been added with good results. Among these are the AIV process, where a mixture of hydrochloric acid and sulfuric acid are added (See AIV silage).

Many experimenters are getting equally good results with phosphoric acid. Molasses has also been used as a conditioner to provide more sugar and acid development.

Ground grain such as corn, corn cob meal, ground barley and ground wheat may be added as conditioners. These conditioners also add to the dry matter. More recently wilting of the crop for two or three hours in the sunshine before ensiling acts as a good conditioner and produces much better silage than crop not wilted. Researchers calculate that the wilting will reduce water content so that the sugar content per pound for forage is increased. Other silage preservatives successfully used are sulfur dioxide and sodium bisulfite. Dried whey has also been used.

Whey Silage—Whey, liquid or dried, may be added to ensilage in place of molasses to produce the desired type of fermentation.

Slender Wheat-Grass, (*Agropyron tenerum*)—An excellent drought resistant grass native to North America and well adapted to cultivation in northern plains especially. Also known as Western Ryegrass.

Total dry matter	46.9%
Digestible protein	2.5%
Total digestible nutrients	27.5%
Nutritive ratio	1.99

Slop—Kitchen or similar waste containing nutritive matter fed to animals.

Small Grain—Any cereal having small kernels as wheat, oats, barley, etc., as distinguished from corn which has large kernels.

Soapweed—See Yucca.

Sowing Crop—A crop cut green and fed directly from the field to livestock.

Sorghum, (*Andropogon sorghum* or *Sorghum vulgare*, var.)—A cereal grain and forage plant resembling the corn plant, of tropical origin, but now grown largely in dry belts of the temperate regions. The sorghums are of two general types: (1) sweet sorghums or sorghos commonly called cane. The pulpy stems filled with sweet juice grow 6 or 7 ft. tall with erect grain heads and are used for forage rather than for grain. The juice also is used for the manufacture of sorghum syrup, a common "sweet" in the corn belt. Sweet sorghum hay is often called "cane hay."

(2) The grain sorghums, stems filled with sour juice, grow 1½ to 5 or 7 ft. tall, and are used for both grain and forage. The sorghum grain is similar to corn both in composition and feeding value. The fol-

lowing varieties are popular among the grain sorghums: kafirs, milos, feteritas, kaoliangs, durras, shallu (also known as "Egyptian Wheat," "California Wheat," "Desert Wheat.") hegari, darso, shrock (sagrain is a well known strain of shrock).

	Hay	Silage
Total dry matter	88.9%	25.4%
Digestible protein	3.3%	0.8%
Total digestible nutrients	52.4%	15.2%
Nutritive ratio	1:14.9	1:18.0

Grain Sorghums—A group of drouth-resisting, grain-yielding grasses grown largely in the more arid of the western states. Kafir and Milo are the most widely grown varieties.

Sorgo—Same as Sweet Sorghum. See Sorghum.

Sotol, (Dasylirion, spp.)—See Yucca.

Soybean, (Soja max)—A hairy annual legume plant native to Asia, bushy to twining in habit, growing 2 to 5 ft. high or more. It is drouth-resistant and will withstand considerable frost. Soybeans are very rich in high-quality protein and in oil. They have long been cultivated in China, Japan, and other Asiatic localities as an important food for man, taking the place of meat in the diet. They make excellent feed for dairy cattle and other stock, as forage, grazing, and concentrate. The soybean crop of the U. S. is rapidly increasing and is being used to some extent for industrial purposes. Approximately 70% of soybean production goes into the production of seed, the oil from which is used largely in industry. Oilmeal cake, a by-product, as well as the hay and silage, is used for livestock purposes. See Soybean Oil Meal, Soybean Flour, Soybean Silage.

	Seed
Total dry matter	90.0%
Digestible protein	33.7%
Total digestible nutrients	87.6%
Nutritive ratio	1:1.6

Soybean Oil Meal—The residue remaining after the oil has been expressed from soybeans. Soybean oil meal is a valuable protein-rich concentrate for dairy feeding.

Digestible nutrients:

Total dry matter	91.0%
Digestible protein	37.0%
Total digestible nutrients	77.9%
Nutritive ratio	1:1.1

Soybean Straw—A feed of little value, consisting of coarse stems with a small amount

of leaves. It should be used as only part of the roughage and should be supplemented with legume bays.

Total dry matter	88.8%
Digestible protein	1.1%
Total digestible nutrients	38.6%
Nutritive ratio	1:34.1

Spanish Bayonet—See Yucca.

Spelt, (Triticum sativum, spelta)—A relative of wheat closely resembling emmer and used in the same way. See Emmer.

St. John's Bread—See Carbo-Bean Meal.

Stillage—The watery residue remaining after the coarser particles are strained out, following the distillation of liquors and alcohol from grain. The water-soluble material that passes through the strainer, known as thin stillage or thin slop, is sometimes condensed and dried and forms dried distillers' solubles. When these solubles are added to wet distillers' grains and dried, they are called dark grains. Corn distillers' dried grains are medium high in protein and high in fat, highly digestible, fairly bulky, and equal to corn in total digestible nutrients.

Succulent Feed—A feed which contains the natural juices of green forage. Some of the most common succulent feeds are green grasses, silage, roots, and wet beet pulp. Some form of succulence is very desirable for economical milk production.

Sudan Grass (Sorghum vulgare var. sudanense)—An annual growing in clumps with stems from 4 to 7 feet high. The many leaves are long and narrow. Seed is borne in open panicles. It is drouth-resistant and a heavy yielder. Its chief uses are as an emergency hay crop, summer forage or as a catch crop.

	Hay	Pasture
Total dry matter	89.4%	21.6%
Digestible protein	4.3%	2.4%
Total digestible nutrients	48.6%	14.3%
Nutritive ratio	1:10.3	1:5.0

Sugar Beets, (Beta vulgaris, var.)—A root crop used chiefly for sugar production, but on account of its palatability and rich sugar content up to 16%, it is also well liked by stock. It is occasionally fed to dairy cows on test. For feeding it is used mostly in the form of molasses and beet pulp, by-products of the sugar industry.

Total dry matter	16.4%
Digestible protein	1.2%
Total digestible nutrients	13.7%
Nutritive ratio	1:10.4

Sugar Cane, (*Saccharum officinarum*)—The tops and leaves of common sugar cane, removed on harvesting the cane make a good forage for livestock. In certain regions the entire cane is often used as green forage or may be put in the silo or cured in large round shocks.

	Pasture	Silage
Total dry matter	25.7%	21.9%
Digestible protein	0.6%	0.5%
Total digestible nutrients	12.5%	13.3%
Nutritive ratio	1 19.8	1 25.6

Sugar Cane Bagasse—The residue after most of the juice has been pressed out of the crushed stalks of sugar cane. Dried bagasse mixed with cane molasses is sometimes fed to cattle and other livestock. The bagasse is also manufactured into fiber board or used as fuel. See also Sugar Cane Pulp.

Total dry matter	91.8%
Digestible protein	0.0%
Total digestible nutrients	20.5%
Nutritive ratio	1 11

Sugar Cane Pulp—Small pithy fragments of stalks screened out of sugar cane bagasse that is to be used in the manufacture of fiber board. These screenings mixed with cane molasses are used to a limited extent for livestock feeding.

Total dry matter	93.8%
Digestible protein	0.6%
Total digestible nutrients	44.5%
Nutritive ratio	

Sunflower—A plant grown for its seeds which are used for stock food and which yield an edible oil.

Sunflower Seed Oil Cake—Sunflower (*Helianthus annuus*) Mammoth Russian variety grows well in many parts of the United States and Canada and is used to some extent as a soiling and a silage crop. The oil cake made from the residue of the seed after the oil has been expressed compares well with linseed meal in protein content, contains more fat but also more fiber. It is well liked by animals and has good keeping qualities. Its fat produces a soft butter if it is fed in large amounts to dairy cows. In Russia sunflower seeds and oil are used largely as human food and the cake made from the residue of seeds was exported for feed for dairy cows before World War II.

Total dry matter	91.03%
Digestible protein	45.0%
Total digestible nutrients	70.8%
Nutritive ratio	1 0.6

Swede—A variety of rutabaga. See Rutabaga.

Sweetclover, (*Melilotus* species)—A biennial, sometimes annual leguminous plant grown widely for both hay and pasture for dairy cattle. It is important as a legume in the drier western states and in cornbelt rotations. Its chief use is as pasture or hay. It is distinguished by its tall, second year woody, upright growth. In feeding sweet clover hay or silage to cattle, care must be taken to feed alternately with other roughages to prevent sweet clover disease (hemorrhage from lack of clotting of the blood).

	Pasture	1st yr	2nd yr
Total dry matter	29.2%	91.8%	90.7%
Digestible protein	3.8%	11.9%	9.4%
Total digestible nutrients	19.1%	50.3%	47.3%
Nutritive ratio	1 4.0	1 3.2	1 1.0

Sweet-Clover Screenings—The ground screenings may be used as part of the concentrates for stock. They are lower in protein and higher in fiber than alfalfa-seed screenings and tests have shown a good grade to be equal or superior to wheat bran in feeding value.

Total dry matter	90.1%
Digestible protein	17.8%
Total digestible nutrients	61.7%
Nutritive ratio	1 2.0

Sweet Potatoes, (*Ipomea batatas*)—The surplus or cull sweet potatoes are used in the South for stock feeding. Sweet potatoes are high in dry matter, rich in starch, low in protein, calcium and phosphorus and therefore must be supplemented with other feeds which furnish the necessary protein and minerals.

Total dry matter	31.8%
Digestible protein	0.2%
Total digestible nutrients	25.6%
Nutritive ratio	1 127.0

Sweet Sorghum—See Sorghum (I).

Swill—A semi-liquid food for animals especially for swine composed of the animal or vegetable refuse of kitchens, markets or stores mixed with water or skimmed or sour milk.

Tame Hay—Hay cut from cultivated grasses.

Tankage—Dried animal residues as bones, tendons, etc., a by-product of slaughter houses rendering plants, etc., usually freed from the fat and gelatin and used as a fertilizer and feeding stuff. See Digester Tankage, Dry Rendered Tankage.

Teosinte, (*Euchlaena Mexicana*)—A tropical grass related to Indian corn, requiring rich moist soil. It is not important in the United States because sorghum and Japanese cane surpass it in yield.

	Pasture
Total dry matter	21.3%
Digestible protein	1.0%
Total digestible nutrients	13.5%
Nutritive ratio	1:12.5

Tepary Beans, (*Phaseolus acutifolius*)—A variety of field bean used as a hay crop in the Southwest. It is equal to cowpea hay or alfalfa hay for dairy cows and heifers. See Field Bean Feed.

	Hay
Total dry matter	90.0%
Digestible protein	11.5%
Total digestible nutrients	48.1%
Nutritive ratio	1:3.2

Thousand-headed Kale—A tall, many-branched, leafy type of kale, used as green feed for cattle and poultry.

Timothy, (*Phleum pratense*)—A perennial bunch-type grass growing 20 to 40 inches high. The stems emerge from a bulblike base and form large clumps. The seed head is a 2 to 4 inch cylindrical, raceme-like panicle. The grass is noted for its high production of highly nutritious hay in its adapted region—the Northeastern, North Central and Rocky Mountain Valleys of the U. S.

Prized as a hay for horses. Fairly satisfactory for dairy cows if properly balanced with protein rich hay or feeds.

	Hay
Total dry matter	89.0%
Digestible protein	2.9%
Total digestible nutrients	49.1%
Nutritive ratio	1:15.4

Tomato Pomace—A by-product in the manufacture of tomato juice or catsup consisting of the skins, pulp and seeds. Dried tomato pomace is satisfactory for dairy cows when forming 15% of the concentrate mixture.

Total dry matter	94.7%
Digestible protein	16.0%
Total digestible nutrients	56.6%
Nutritive ratio	1:2.5

Tomillo—See Mesquite and Tomillo.

Total Digestible Nutrients—The percentage of each nutrient is multiplied by the coefficient of digestibility for that nutrient in order to get the percentage of digestible nutrients in a feeding stuff. The total digestible nutrients is determined by taking

the sum of the digestible crude protein, the digestible carbohydrates and $2\frac{1}{4}$ times the digestible fat. They are the nutrients of the feeding stuff expressed as carbohydrate equivalents.

Tree Leaves and Twigs—Sometimes fed to farm animals when better feed is scarce. Ground and crushed twigs, stems, and leaves have occasionally been used in certain mixed feeds as an absorbent for molasses.

Trefoil, Bird'sfoot, (*Lotus corniculatus*)—Perennial, fine-stemmed, leafy legumes with five leaflets directly on the stem. The showy flowers are yellow. Seeds are borne in pods that spread giving the impression of a bird's foot. This legume, used chiefly for hay, is adapted to the Northeast and also parts of Oregon and California. It is adapted to soils too wet for Alfalfa and is more persistent than Ladino Clover.

	Hay
Total dry matter	91.2%
Digestible protein	9.8%
Total digestible nutrients	53.0%
Nutritive ratio	1:4.6

Turnips, (*Brassica rapa*)—An early maturing, easily grown, root crop used mainly for sheep feeding, but may also be fed to cattle.

Total dry matter	9.3%
Digestible protein	0.9%
Total digestible nutrients	7.8%
Nutritive ratio	1:7.7

Unhulled Peanut Oil Meal—See Whole-Pressed Peanuts.

Urea, (Feed)—A single nitrogenous compound now manufactured synthetically on a large scale. It is used to some extent in commercial feeds for ruminants to replace a part of the protein normally added. Rumen bacteria under proper conditions are capable of synthesizing protein from this simple compound, which then becomes available to the host animal.

Vegetable Ivory Meal—A fairly digestible meal made from the residue in the manufacture of buttons from Ivory Palm nuts (*Phytelephas macrocarpa*) or vegetable ivory. It is about equal to barley grain in total digestible nutrients, but is very low in digestible protein.

Total dry matter	89.4%
Digestible protein	0.8%
Total digestible nutrients	79.0%
Nutritive ratio	1:97.8

Velvet Bean, (*Vizolobium* spp.)—An important southern crop grown in combination with corn and commonly used for grazing cattle during the autumn and winter after the ears and some of the ripe beans have been picked. It makes valuable feed green manure and silage. Ground beans and pods are not very palatable but can be used satisfactorily for dairy cows when not forming too large a part of the ration.

	<i>Hay</i>	<i>Pasture</i>
Total dry matter	92.8%	79.9%
Digestible protein	9.5%	2.5%
Total digestible nutrients	56.2%	15.5%
Nutritive ratio	1.19	1.36

Vetch—A leguminous annual grown in cool regions for forage for dairy cattle and as a green manure crop. Vetch makes a very palatable hay high in protein and total digestible nutrients. In the United States hairy vetch called sand or winter vetch and common vetch are most commonly used for hay and pasture and when combined with oats make a good silage. Hairy vetch is drought resistant and grows on poor soil. The common vetch, a strain of hairy vetch is common in the South.

	<i>Hay</i>	<i>Pasture</i>
Total dry matter	89.0%	20.4%
Digestible protein	10.1%	2.9%
Total digestible nutrients	55.3%	12.1%
Nutritive ratio	1.45	1.32

Common Vetch, (*Vicia sativa*)—See Vetch

Hairy Vetch, (*Vicia villosa*)—Winter vetch ordinarily an annual but sometimes has a biennial when seeded in the spring. It is more winter hardy and drought resistant than ordinary vetch and may also be grown on poorer soils.

	<i>Hay</i>	<i>Pasture</i>
Total dry matter	88.0%	18.2%
Digestible protein	15.2%	3.5%
Total digestible nutrients	57.1%	12.5%
Nutritive ratio	1.28	1.25

Hungarian Vetch, (*Vicia pannonica*)—See Vetch

Winter Vetch—The Hairy Vetch

Western Rye—See Slender Wheat-Grass

Wet Rendering Method, (Also called Digestor Method)—A method of processing tankage—meat scraps, fat trimmings and scrap bones—cooked for several hours by steam under pressure. The fat is skimmed off the top, soupy liquid is drained off and evaporated to a gluey consistency; the solid

residue is put through hydraulic presses to remove surplus fat and water; the gluey mass is added to the solid meat residue and dried in steam jacketed dryers, then ground into meal. See Digester Tankage.

Wheat, (*Triticum sativum*)—A leading cereal grain widely grown for the manufacture of flour. Although it is not used to the same extent as corn for a stock feed, dairy animals are often fed the low grades of wheat and the by-products of the wheat milling industry. Of these, wheat bran and middlings are by far the most important. See Wheat Bran, Wheat Middlings, Wheat Red Dog Flour (spring wheat), Brown Shorts and Gray Shorts (winter wheat).

	<i>Concentrates</i>
Total dry matter	89.5%
Digestible protein	11.1%
Total digestible nutrients	80.0%
Nutritive ratio	1.62

California Wheat—See Shallu

Club Wheat—A wheat with thick, compact club-shaped spikes; the grain does not shatter and it may be harvested long after it is ripe.

Desert Wheat—See Shallu

Egyptian Wheat—See Shallu

Poulard Wheat—Any of several varieties of wheat (*Triticum Turgidum*) suitable only for stock feed and little grown in the United States. They have four-sided compact awned spikes, thick humped yellowish to red kernels and long pithy or solid stems.

Wheat Bran or Bran—A popular feed stuff composed of the outside coatings of the wheat kernel. It is a by-product of the manufacture of wheat flour and is a very desirable feed for dairy cattle since it is bulky, palatable and laxative in its effect. It is very high in phosphorus but low in calcium. Standard Bran is pure wheat bran to which wheat screenings have been added, which fact must be indicated on the label. Country Mill Bran and Middlings are terms applied to these products produced by small country mills where the flour is not so completely separated.

Total dry matter	90.1%
Digestible protein	13.3%
Total digestible nutrients	66.9%
Nutritive ratio	1.40

Wheat Brown Shorts—Same as wheat standard middlings except that these by-products are made from winter wheat and contain slightly less fiber, protein and fat than standard middlings from spring wheat.

Total dry matter	88.5%
Digestible protein	13.9%
Total digestible nutrients	74.2%
Nutritive ratio	1:4.3

Wheat By-Products—Feeds made from the by-products in the manufacture of wheat into flour. Wheat bran, the coarsest by-product, consists chiefly of the bran layers; standard middlings, flour middlings, and wheat red dog flour are the finer by-products of spring wheat; and the finer by-products of the milling of winter wheat are brown shorts, gray shorts, and white middlings.

Wheat Flour Middlings—A by-product of spring wheat milling consisting of standard middlings and red dog flour. The similar by-product of winter wheat is Wheat Gray Shorts (also called Gray Middlings or Total Shorts). They are slightly higher in total digestible nutrients than standard middlings or brown shorts and are sometimes fed to dairy cows as part of a concentrate mixture, but chiefly used in swine feeds. See Wheat Gray Shorts.

Total dry matter	90.6%
Digestible protein	15.4%
Total digestible nutrients	79.2%
Nutritive ratio	1:4.1

Wheat Gray Shorts—A feed very nearly the same as wheat flour middlings except that gray shorts are a by-product in the milling of flour from winter wheat instead of spring wheat.

Total dry matter	89.1%
Digestible protein	13.8%
Total digestible nutrients	77.2%
Nutritive ratio	1:4.6

Wheat Mixed Feed—A feed composed of the wheat bran and flour middlings or gray shorts as obtained from commercial milling.

Total dry matter	90.7%
Digestible protein	13.1%
Total digestible nutrients	70.1%
Nutritive ratio	1:4.4

Wheat Red Dog Flour—A by-product from spring wheat consisting chiefly of the aleurone or outer protein layer, small quantities of flour, and fine bran particles. It is highly digestible and is higher in total digestible nutrients than the entire wheat grain. Used chiefly in swine and calf feeds.

Total dry matter	89.6%
Digestible protein	15.8%
Total digestible nutrients	85.5%
Nutritive ratio	1:4.4

Wheat White Shorts—This feed is similar to Wheat Red Dog Flour except that it is a by-product from the milling of winter wheat and not spring wheat.

Total dry matter	89.4%
Digestible protein	14.5%
Total digestible nutrients	86.0%
Nutritive ratio	1:4.9

Wheat Standard Middlings—A feed composed of the finer portions of the bran and germ and very little red dog flour. It is a by-product of wheat flour manufactured from spring wheat, and is used to some extent as a feed for cattle. Generally recommended that it form not more than $\frac{1}{3}$ of the concentrate mixture.

Total dry matter	90.1%
Digestible protein	14.3%
Total digestible nutrients	77.2%
Nutritive ratio	1:4.4

Whey Bran Feed—A whey bran feed for dairy cattle has been prepared and used in Sweden. The product is produced by drying a mixture of 33 kilograms of rye bran and 1000 kilograms of fresh whey. The whey is concentrated to 15 to 20% moisture before it is mixed with the bran. The mixture is then tunnel or air dried. This feed should have special interest in certain dairy sections in this country.

White Crop—A term sometimes used to describe a grain crop that turns from green to white as it ripens; as oats, barley, wheat or rye.

White Middlings—See Wheat White Shorts.

Witch Grass—See Quack Grass.

Yeast, Irradiated—See Irradiated Yeast.

Yellow Trefoil, (*Medicago lupulina*)—A creeping annual legume growing like white clover and related to alfalfa. It sometimes furnishes a large part of the permanent pasturage on the black prairie soils of Alabama and Mississippi. Also known as Black Medic.

Total dry matter	22.7%
Digestible protein	3.4%
Total digestible nutrients	13.8%
Nutritive ratio	1:3.1

Yucca, (Yucca, spp)—Yucca soapweed and Spanish bayonet are valuable emergency feed crops for range cattle in the Southwest. The dry leaves are burned off and the plants are finely chopped or shredded and fed to cattle. The forage may also be ensiled. Sotol a close relative of Yucca is also used in this manner.

Total dry matter	92.6%
Digestible protein	24%
Total digestible nutrients	52.2%
Nutritive ratio	1:20.3

End of Feeds and Feeding Terms

Feeding the Dairy Herd—See Handbook P 1

Fehling's Solution—A reagent for the detection and quantitative determination of reducing sugars in which copper is maintained in alkaline solution by means of sodium potassium tartrate with which it forms a complex.

It consists of the following two solutions which are mixed in equal parts immediately before use.

Copper Sulfate Solution—Dissolve 34.639 gms of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ in water and dilute to 500 ml. Filter through prepared asbestos and store in a clean bottle.

Alkaline Tartrate Solution—Dissolve 173 gms of Rochelle salts (sodium potassium tartrate) and 50 gms of NaOH in water and dilute to 500 ml. Let stand for 2 days, filter through prepared asbestos and store in a clean bottle with rubber stopper.

Fell—The thin tough membrane covering a carcass immediately under the hide or pelt.

Female—That sex which bears young' opposite of male.

Pertaining to any reproductive organ or portion of a plant body which is concerned with the development of a new individual.

In machinery a hollow part of a tool etc., into which is inserted a corresponding or male part.

Fence—Used to enclose a field or other special space. Materials used for this purpose may be wire, rail, posts, boards, palings, hedge, water filled ditches, etc.

Ferment—A substance capable of producing fermentation as yeast. To undergo fermentation. Former name for an enzyme.

Fermentation—A metabolic process which produces chemical changes in an organic substrate through the action of enzymes secreted by microorganisms or other cells. An important example in the dairy field is the souring of milk by the action of lactic acid bacteria on the lactose substrate.

Fermentation Test—See Dairy Tests.

Fermentation Test, (Cheese)—See Dairy Tests.

Fermented Flavor—See Cheese Defects.

Fermented Milks—See Milk—Fermented.

Fertile—Prolific, fruitful. Also applied to rich or fertile land. Ability to produce fruit or offspring as opposed to sterile.

Fertility—In animal husbandry the ability to produce normal young, breeding capacity. Also the ability of a soil to provide adequate and balanced amounts of nutrients to support healthy growth of plants when other conditions are not limiting.

Fertilization—In genetics the union of male and female germ cells or gametes; the penetration of the female egg cell by the male sperm cell.

Fertilization, (plants)—The union of the male (pollen nucleus) and female (egg) cells in a flower causing the development of the new individual.

Fertilization, (Self)—Union of the male and female cells from the same plant to form the new individual.

Fertilization, (Soil)—Application to the soil of those elements required for plant growth.

Fertilizers—Organic or inorganic material of natural or synthetic origin which is added to a soil in an attempt to provide plant nutrients. See Manure.

Commercial Fertilizer is industrially prepared for sale on the open market. This mixture usually includes liming materials, nitrogen compounds, phosphates and potash, but generally excludes barnyard manures except when dried and packaged.

Complete Fertilizer is any combination of carriers of nitrogen, phosphorus and potassium applied to the soil to meet the needs of crops for these nutrients. Some more complex formulas may contain minor elements.

Guarantee Chemical of—In fertilizers a statement of the guaranteed available nutrient content as determined by chemical analysis expressed as per cent of total nitrogen, available phosphoric acid and water soluble potash.

Feta—See Cheese.

Feterita—See Feeds & Feeding.

Fetus—The unborn young (after it has taken form in the womb or egg) in the later stages of development. The first or embryo stage refers to the period from conception to the third month, after which it is called the fetus.

FFA—Refers to the Future Farmers of America Organization. It is a national organization of, by, and for boys studying vocational agriculture in public secondary schools.

Fiber—The coarse, woody cell walls of mature plants, as the cornstalk. This material found in feeds is for the most part not digestible by the cow, its principal value being its bulk which supplies roughage. Usually referred to as crude fiber, it is composed chiefly of insoluble carbohydrates such as cellulose.

Fibrin—The insoluble protein in blood which forms the network or foundation of the blood clot.

It is a protein found in milk in very minute quantities.

Fibrosis—See Diseases in Cattle.

Field—Cultivated land used for crops or pasture.

Field Bean Feed—See Feeds & Feeding.

Field Capacity, (Soil moisture)—Amount of water remaining in a well-drained soil when the velocity of downward flow into unsaturated soil has become small. It is expressed as a percentage of weight of oven-dry soil.

Field Crops—Generally crops grown for agricultural purposes as rye, wheat, corn, soybeans or cultivated hay.

Field Method or Laboratory Method of Determining Cost of Milk Production—See Cost of Milk Production.

Field or Kidney Bean Straw—See Feeds & Feeding.

Field Pea, Field Pea Hay, Field Pea Straw—See Feeds & Feeding.

Field Test—This term as differentiated from a laboratory test denotes the testing of milk or other food product outside the laboratory. Field tests are usually conducted by inspectors, representatives of dairy companies, etc., and may take place on the road, farm, or in demonstrational and educational work among farmers and others.

Fifth Wheel—A horizontal wheel or segment made up of two parts rotating on each other about the king-bolt above the axle of a vehicle and beneath the frame or body, forming an extended support to prevent upsetting or careening.

Filial—A term used to denote relationship, according to Mendel's Law of inheritance, as a generation or generations coming in direct lineage.

Fill—In livestock marketing, the water and feed which are given animals when they arrive at a destination after having been transported some distance.

Filled Cheese—See Cheese.

Filled Milk—See Milk, Processing and Processing Equipment.

Filler—See Bottle Filler, Can Filler.

Fillers—See Stabilizers.

Filling—In Animal Husbandry, the practice of inducing cattle to drink a large amount of water about an hour before they are taken into the show ring, in order to improve their appearance and keep them alert. This is usually accomplished by withholding water the night before the showing and feeding each animal a double handful of salt to stimulate thirst.

Film-drying System—See Drum Drying System.

Film Grain—See Milk, Processing and Processing Equipment.

Film Heater—See Drum Heater.

Films, Milk—Milk allowed to dry on utensils forms a film which is difficult to remove. Therefore it is important to rinse dairy utensils immediately after use. If the film is allowed to dry and is not removed, other films attaching thereto cause the formation of scale or milk-stone which necessitates the use of special acid descaling solutions.

Filter—A piece of apparatus designed to remove the visible dirt from milk. It generally consists of a cotton pad or flannel-like cloth through which the liquid is forced. Also, to force the milk through a filter cloth by pressure.

Filter, Continuous—A flat shaped piece of dairy equipment which generally is inclined at an angle of about 45° and contains a cloth filter stretched across the entire inside area of the mechanism with a strong screen over it to hold it taut against the pressure of the milk. Milk enters through the inlet in the bottom plate under ordinary plant pressure and passes through the filter cloth discharging through the outlet in the upper plate while the extracted sediment is washed down from the under side of the cloth into the sediment trap at the bottom.

Filter, "In the line"—Very similar to the bag filter. This type of filter consists of a cylinder much greater in diameter than the sanitary pipe line in which a filter bag is placed over a perforated metal frame. See Bag Filter.

Filter Pad Butter Test—See Dairy Tests.

Filters, Lath—Lath filters are made of building laths and are used for the disposal of dairy wastes. The filtering medium is 5 ft deep consisting of several layers of laths. The laths are placed 1.25 in. apart and each layer is placed at right angles to those of the layer above.

Finish—In livestock marketing the amount of flesh or the fat which an animal carries.

Finish of Cheese—See Cheese.

Fiore Sardo—See Cheese.

Fire Prevention in Barns—See Handbook, 'Dairy Farm Structures' P. 210.

Firkin—See Butter.

Firm Close Cheese—See Cheese.

Fish Eyes, Yeast Holes, Gas Eyes—See Cheese Defects (Texture).

Fishiness—See Butter Defects.

Fiske Cryoscope—See Dairy Tests.

Fistulous Test—See Diseases in Cattle.

Fitting—The preparation and training of cattle for the show or sale ring. Under this heading many things must be considered such as training and cleaning the animals so that they will show off to best advantage in the show ring. Attention must also be given to the following points: 1) Chipping—the head and tail of animals are clipped and the neck may be clipped in most cases. 2) Brushing stimulates the circulation of the blood and helps make for a much desired smooth coat of hair. 3) Washing—The animal should be washed with mild soap plus considerable rubbing. All the soap must be

rinsed out of the hair. 4) Blanketing—The animal should be blanketed after washing in order to keep the coat clean and the hide in good condition. It also helps to make the coat smooth and gives the animal the desired finished appearance which can not be accomplished in any other way. 5) Polishing Horns and Hoofs—The feet and the horns of the animal should be in good condition for the animal to be shown to best advantage. The hoofs should be carefully trimmed and shaped. This is done with such simple tools as a rasp, chisel and pinchers. If the animal is shown with horns they should be smooth and polished often. A metal polish is applied to the horns and rubbed until they shine. The wise showman will be shaping up the horns and feet several months before the show season.

Fix Type—In animal husbandry breeding to secure a strain of animals that can be relied upon to breed fairly true to the characters desired.

Fixation of Nitrogen—See Nitrogen Fixation.

Flagella—Hairlike projections of microorganisms. These whip-like lashes propel the microorganism from place to place. They are believed to be extrusions of the protoplasm through the cell wall. Also known as Cilia.

Flake Buttermilk—See Milk, Buttermilk.

Flake Ice or Chopped Ice—There is considerable demand for ice chips or flakes for direct cooling of milk bottles in crates and for many other uses in restaurants, stores, etc. As this demand grows many firms are now supplying needed equipment. Among these machines according to Farrell now widely used is a device consisting of a vertical freezer with a double walled steel cylinder open at both ends. A rotor carrying the water distributing pipe and knives for removal of ice is mounted inside the freezer and is connected to a gear reducer located on top of the freezer. A circulating water pump and sump are used to furnish water for this equipment. Inside the cylinder is a moving knife with an edge of stellite. Ice is formed by spraying water on the inner surface of freezer where it freezes almost instantly and is scraped off by the rotating knives. A bin is usually set underneath to act as a storage for the chopped ice. Many concerns however still use old type ice crushers where regular cakes of ice are rapidly crushed into fine particles and held in storage until needed.

Flake out—See Cheese.

Flaky Texture—See Ice Cream Defects.

Flash Pasteurization, Flash Sterilization—See Milk, Processing and Processing Equipment.

Flat Flavor—See Milk and Cream Defects.

Flat-rate Plan—A plan under which a milk producer is paid a definite uniform price for milk regardless of the use to which the milk is put. Formerly the price paid was low enough to allow for converting the milk to manufactured products. At the present time in many places all milk purchased under the flat-rate plan is sold as fluid milk.

Flats—See Cheese.

Flavin—Any one of a class of yellow-colored, fluorescent, water-soluble nitrogenous pigments found widely distributed in plant and animal life. Also prepared synthetically.

The term Riboflavin (Vitamin G) is generally used to include the flavins found in various foodstuffs of both animal and plant origin. Specific names are also given as follows:

Lactoflavin—the flavin in milk, **Ovaflavin**—the flavin in eggs, and **Heptoflavin**—the flavin in liver.

See Riboflavin for description of this vitamin.

Flavor—A combination of the sensations of taste, perceived in the mouth, with those of smell, produced through the medium of the inner nasal passages.

Flavor, Cheese—See Cheese.

Flavoring Extract, (U.S.D.A. definition)—A solution in ethyl alcohol of proper strength of the sapid and odorous principles derived from an aromatic plant, or parts of the plant, with or without its coloring matter, and conforming in name to the plant used in its preparation.

Flavors (for ice cream and sherbets)—See Ice Cream.

Flavors, Off—See Off-Flavors.

Flaxseed and Ground Flaxseed—See Feeds and Feeding.

Flesh—The meaty part of animals and birds used as food, as distinguished from fish.

Flexible Wrappers in Cheese—See Cheese.

Flies, (Construction Features to Exclude, from City Milk Plants)—A limited number of doors, only such as are actually needed for efficient operation, with fans or metal air ducts above them, steel frame windows, dark, narrow passages through which to deliver milk cans and plenty of light inside the buildings aid in discouraging flies in milk plants. Efficient plants also make liberal use of most approved fly sprays.

Flocculation—The coagulation of colloid particles due to the neutralization of their electric charge.

The aggregation of individual soil particles into small clusters or groups.

Flooded System of Refrigeration—An adaptation of direct expansion refrigeration whereby liquid ammonia is held at a predetermined level in the expansion coils or shell of an ice cream freezer. By means of this system all tubes contain liquid, and heat is transferred much more readily.

Floors—See Buildings, Dairy.

Floret—Each flower of a spikelet.

Flost—See Cheese.

Flow Diversion Valve—See Milk, Processing and Processing Equipment.

Flower—The parts of a plant active in sexual reproduction and the surrounding protective leaves.

Flower Cheese—See Cheese.

Fluffy Texture—See Ice Cream Defects.

Fluid Milk, Fluid Milk (Homogenized Vitamin D)—See Milk and Cream.

Fluidity—The quality of being fluid or capable of flowing. The reciprocal of viscosity.

Fume—An incline channel for conveying water from a distance to be utilized for irrigation, power, transportation, etc.

Fluorescence—The property of certain substances (such as riboflavin in milk) of absorbing ultraviolet light and re-emitting it as visible light.

Fluorine—See Feeds and Feeding.

Flush-Type Valve—See Milk, Processing and Processing Equipment.

Flushing—The practice of feeding female animals (especially ewes) especially well, just previous to the breeding season, in order to stimulate their reproductive organs to the maximum activity, which is thought to result in a higher percentage of conceptions.

Fly Bait, (Poison)—Dry baits made up of fly attractant material plus one of three or four phosphate insecticides are among the most commonly used at the present time. They are sold under various trade names although fundamentally they are very similar. Malathion is among the most common ingredients in the dry baits on the market. It is generally present in 1 or 2% concentration.

A home made Malathion-sugar dry bait is easily made up. Here are the essential directions:

- 1 Malathion—a new 4 lb bag of 25% wettable powder
- 2 Sugar—the ordinary granulated variety

Equipment Needed

- 1 1 or 2 quart jar with a threaded lid
- 2 Two lids—one solid the other with 6 or 8 holes
- 3 Wooden spoon or stick with which to stir the sugar-malathion mixture
- 4 Tablespoon to use for measuring

Preparing the Bait

- 1 Put one pound of sugar in jar
- 2 Add three tablespoonfuls of the malathion powder
- 3 Shake and stir until very thoroughly mixed. You should get some malathion on every granule of sugar.

This amount of solution should be enough to treat a 20 to 40 cow farm each day for at least 4 days. Bait is most satisfactory if fresh or prepared within a ten day period.

How to Use the Bait

- 1 Replace solid lid with perforated lid
- 2 Shake sugar bait thinly on to floors, window sills, aprons, etc. Treat dry surface on which flies commonly gather.

Caution: Do not use in kitchens, dining rooms, etc. but service areas outside may be treated.

- 3 Regarding the amount to use approximately one tablespoonful of bait to each 500 or 1000 square feet of floor space depending somewhat on the fly population.

Commercial malathion sprays can be used in the ordinary spray container. Spray at the rate of about one gallon for each 1000 square feet on painted surfaces and two gallons for each 1000 square feet on unpainted surfaces. Treat all surfaces where flies congregate that is, walls, pipes, wires, braces, ceilings, stanchions, window sills, fences around garbage cans, etc.

Repeat applications as necessary to keep fly population at low level.

Caution: Do not use Malathion in milk rooms, kitchens or inside dwellings. It may be used around surface areas. Avoid contamination of food and feed products. Remove animals from buildings while they are being sprayed. Since all insecticides are poisonous they should be kept out of the reach of children.

Fly Breeding Places, Control of—In order to control flies the first step should be to dispose of the breeding places. Manure should regularly be hauled away and spread on fields whenever possible to prevent development of flies. When cows are kept in small enclosures brush drags should be used to spread droppings in thin layers to insure quick drying. This also prevents the flies from developing.

Fly Killers, Electric—Parallel wires charged with current used in controlling flies around dairy buildings.

Fly, Life History of, (House Fly—*Musca domestica*)—The female fly lays between 75 and 125 eggs in various places such as piles of warm moist horse manure and fresh cow manure in stalls where manure and urine fall and in damp soil containing organic material. Tiny maggots hatch in 8 to 48 hours and in 8 or 10 days the adult fly appears. The average life span is 9 or 10 days although in warm temperature it is sometimes 14 or 15 days.

Fly Poisons—Poisonous chemical solutions used for killing flies. Proprietary solutions of formaldehyde and sodium salicylate placed in dishes or sponges are most commonly used.

Solutions of cobalt or arsenic are also used.

Fly Repellent—A spray material used upon cattle for the purpose of keeping off flies. The compounds now used are composed chiefly of some light petroleum distillates with the addition of pyrethrum powder. In recent years many more effective but safe chemicals are also used.

Fly Spray, DDT (Dichlorodiphenyltrichloroethane)—DDT was used extensively as a fly spray during World War II, but flies gradually built up a resistance to it thus making it less effective. When used on milking cows and in dairy barns it was carried over to some extent into the milk. It is now recommended for use on milking cows or in dairy barns.

Fly Traps—Mechanism of various types used for catching flies. They are used to the best advantage early in the spring, supplementing other control methods. The most effective bait is blackstrap molasses mixed with water, but milk containing sugar may be used.

Foam Test—See Dairy Tests.

Foaming—May be described as a mixture of gas and air in a liquid. In milk, foaming is encouraged by substances being adsorbed at the surface. The tendency of milk to foam when agitated is evidence of the presence of a surface tension depressant such as proteins. With the increase of fat content of milk or cream the surface tension is reduced, therefore the addition of fat globules decreases interfacial tension. It has been shown that foaming decreases upon aging of the milk. Research indicates that milk foams least at temperatures from 70 to 80°F.

Foaming, sometimes called priming of the boiler, is caused by excessive dissolved, or in colloidal, suspended solids. This concentration of solids in the water can be kept under control by adjusting the frequency and amount of the blowdown, by opening the valve near the bottom of the boiler and flushing out the mud and loose scale that have accumulated. (Blowdown is the term designating this process of cleaning out the sludge from the boiler.)

A concentration not to exceed 100 to 150 gms. per gallon of dissolved solids will usually not cause foaming.

Foamy Body—See Ice Cream Defects.

Fodder, Fodder Corn—See Feeds and Feeding.

Foggiano—See Cheese.

Fogging the Barn—The practice of applying fly repellants or sprays with heavy pressure spray guns in tightly closed barns or dairies in amounts sufficient to kill the insects. A foggy atmosphere is produced by the heavy spray.

Folded—When the halves of a leaf are closely applied to each other in the shoot as in meadow grasses.

Folic Acid—See Vitamins.

Folin and Ciocalteu's Reagent—A reagent consisting of tungstate and phosphomolybdate which forms a blue color with phenols. It has been used in the phosphatase test (with disodium phenyl phosphate as substrate) and in detecting and determining tyrosine and tryptophane in protein.

Food—Nutritive material, absorbed or taken into the body of an organism, which serves for the purpose of growth, work, or repair and for the maintenance of the vital processes. In common usage water is not included in food. See Food Values of Milk in Handbook, P. 119, 126, 133.

Food Poisoning—Especially in hot weather there are numerous outbreaks of food poisoning, generally starting with the sudden appearance of gastro-intestinal trouble indicated by vomiting and diarrhoea.

See "Food Poisoning" in Handbook.

Foods, (Plant)—Those products manufactured in green plants which are translocated, stored, and used by the plant for its own growth processes. Foods stored by plants for future use are often referred to as food reserves.

Foot—12 inches as a measure of length. See Weights and Measures. That part of an animal upon which it rests when standing, or upon which it moves.

Foot and Mouth Disease—See Diseases in Cattle, P. 247, 512.

Foot Pound—The unit of work required to lift a pound mass through a distance of one foot.

Foot Rot—See Diseases in Cattle.

Forage—See Feeds and Feeding.

Forage Crop—See Crop, Forage.

"Forage—The Crop of Rising Importance." See Handbook, P. 227.

"Forage Crops For Western United States"—See Handbook, P. 235.

Forage Grass—See Feeds and Feeding.

Forage Harvester—See Corn Harvester.

Force—That which changes the state of rest or motion in matter, measured by the rate of change of momentum.

Forced Air Circulation—A system of refrigeration used in connection with ice cream hardening, cheese curing, etc. It requires, in addition to the necessary machinery of the direct expansion or brine system, a fan, located in the cooling room or coil bunkers. The air is simply the circulating medium for producing the desired refrigeration, and is forced by the fan over the cooling coils and into the room, where it comes in contact with the goods in storage and absorbs heat from them.

Forced Crystallization Period—See Milk Processing and Processing Equipment

Forced Curing **Forced-drying of Cheese**—See Cheese

Forced Feeding—A system of frequent feeding of heavy rations to cows for maximum milk production. This practice is often abused since overfeeding the cow may cause digestive disturbances without necessarily an increase in milk production. A cow has a potential milk producing capacity beyond which point any amount of excessive feeding will not increase the milk flow.

Fore Milk—The term generally given for the first few streams of milk drawn from each teat. Such milk is very low in butter fat content and apt to be very high in bacterial content and therefore should be rejected.

Foreign Bodies—See Hardware Disease

Foreign Color Specks—See Cheese Defects (Color-Cheddar)

Foreign Flavor—See Milk and Cream Defects

Foreign Matter in Milk—Undesirable articles which have not been washed out of milk containers or have fallen into containers and appear in the milk. Great care must be exercised to avoid this possibility and to discover such items during the bottle filling process. Items may vary all the way from bits of hardware to insects etc. A careful system of inspection is an important safeguard.

Forewarmer **Forewarming**—See Milk Processing and Processing Equipment

Foreworking, (in Cheesemaking)—See Cheese

Forze Cheese—See Cheese

Forge—A furnace or shop with its furnace where metal is heated and wrought.

Forking Agitator—See Cheese

Form—The build or outline of an animal. Also a mold used to shape a soft mixture such as ice cream. See Mold.

Formagelle, **Formaggi di Pasta Filata**—See Cheese

Formaldehyde Test—See "Standard Methods for Examination of Dairy Products" as Association of Official Agricultural Chemists (A.O.A.C.) Standards of Analysis

Formalin—A commercial aqueous solution of 40% formaldehyde.

Forming (in Cheesemaking)—See Cheese

Formol Titration for Casein—Sorenson's Titration—See Dairy Tests.

Formula, Chemical—A combination of symbols with their subscripts representing the constituents of a substance and their proportions by weight.

Formula Method of Determining Cost of Milk Production—See Cost of Milk Production

Foul Foot—See Diseases in Cattle

Foundation—The fixing or beginning of a structure. State of being founded. Also refers to the establishing of a herd of dairy cattle.

Foundation Herd—The original group of animals from which the majority of subsequent generation individuals in the herd trace descent.

Four H (4H) Club—An organization sponsored by the United States Department of Agriculture through the extension service of that department and other leaders in which rural boys and girls are taught improved rural practices and ideals of good citizenship. They are so called from their symbol a fourleaf clover having an H on each leaflet signifying the four aims of each club to improve head heart hand and health.

Fowl Meadow Grass, **Foxtail Millets**—See Feeds and Feeding

Fractionate—Chemically speaking means separating a substance into different portions or constituents either by crystallization distillation or by other means.

Frame—The constructional system that gives a building its shape and support strength. The bony structure of an animal.

Frame Construction—Said of buildings in which the exterior walls or partitions are made of wood.

Free Market—A public or city organized market open to everyone.

Free Martin—The female of mixed twins in cattle. Such animals are nearly always sterile. The bull calf of mixed twins is customarily fully fertile.

Free Price—A term applied to the price of a commodity when such price is arrived at through free and uncontrolled bargaining among individual buyers and sellers. Also called Competitive Price. Compare—Administered Price.

Freeze—The change of a liquid to a solid state by the abstraction of heat; to subject to a temperature below freezing.

Freeze-Drying of Milk—See Milk Powder, Processing and Processing Equipment.

Freezer, Ice Cream—Freezers, Types of—See Ice Cream.

Freezing Cheese—See Cheese.

Freezing Point, Milk—That temperature at which ice begins to form in milk. The freezing point of milk is very constant, generally being -0.54 to -0.55°C. , (31.03 to 31.01°F.), the extreme variations being -0.53 to -0.57°C. (31.05 to 30.97°F.). The constancy of the freezing point is not affected by normal variations in the composition of the milk. The Hortvet cryoscope has been adopted as official for detecting added water in milk.

Freezing Point Test—See Dairy Tests.

Freezing Procedure of Ices, Freezing Process, (Ice Cream)—See Ice Cream.

Freezing Rate—As the cooling medium is applied the temperature rapidly drops to approximately 27°F. , the freezing point for Ice Cream Mix. Experiments indicate that temperature of the mix will drop about 0.5°F. after refrigerant is shut off and then gradually rise until the Ice Cream is removed from the freezer.

French-Canadian—A minor breed of dairy cattle, the forebears of which were brought to Canada by French settlers more than 250 years ago, but the breed was developed in Canada. The cattle weighing from 700-900 lb. are about the same size as Jerseys, are active, vigorous, and able to withstand long, cold winters. They are black in color or black with a fawn or orange colored strip down the back and around the muzzle. The milk of this breed tests between 4 and 5% butterfat and the yield is about equal to that of the Jersey.

Freon—A commercial term for a refrigerant which is, chemically, dichlorodifluoromethane ($\text{C}_2\text{Cl}_2\text{F}_2$). It is also known commercially as F-12 and Kmetec No. 12. It is non-toxic, odorless, non-inflammable. It is practically non-corrosive to those metals used in construction of refrigerators, and decomposes only when its vapors come in direct contact with a flame.

Frequency—Frequency in any periodic motion is the number of revolutions or cycles completed in unit time.

Fresa, Fresh Cheese—See Cheese.

Fresh Cow—A cow that has recently calved and is milking.

Freshen—In dairying, a term used to indicate the starting of the secretion of milk after parturition in dairy animals.

Freshly Drawn Milk—See Milk, Freshly Drawn.

Friable—Crumbly; easily worked. Said of soils that are not sticky or plastic.

Fribourg—See Cheese.

Friction, Coefficient of—The coefficient of friction between two surfaces is the ratio of the force required to move one over the other to the total force pressing the two together.

Friesian Clove—See Cheese.

Fro-dex—A trade name for corn syrup solids.

Frog Mouth—See Cheese Defects, (Swiss).

Froker-Hardin Formulas, Fromage a'la Crème, Fromage Fort Cheese—See Cheese.

Frost—State of temperature of the air which causes freezing of water; when temperature goes below 32°F.

Frost's Cellular Test—See Dairy Tests.

Frozen Cream, Frozen Sweet Cream—See Milk and Cream.

Frozen Milk Concentrate—See Milk, Processing and Processing Equipment.

Früstück Cheese—See Cheese.

Fruit—In Botany, the matured pistil of a flower, or ripened ovary of a seed plant and all the tissue that surrounds it whether the product is a grain such as corn or the product of a tree as apples. Fruit is the term commonly used for the edible fruits such as apples, oranges, berries, etc.

Fruit, Fresh-Dried-Candied or Glaced—Grades of, for Ice Cream—Kind of Pack to Use—See Ice Cream.

Fruity Flavor—See Ice Cream Defects and Milk and Cream Defects.

Ftinoporino Cheese—See Cheese.

Fucoma Test—See Dairy Tests.

Fuel Injection Pump—Small plunger pump accurately timed to an engine and capable of pumping fuel oil against high pressure. The pump usually also meters the fuel fed to the engine cylinders in response to governor or operator control. Metering is commonly accomplished in any one of three ways: (1) by opening a bypass valve earlier or later in the plunger's stroke, (2) by varying the length of pump plunger stroke, and (3) by opening inlet valve or unsealing inlet port earlier or later in the plunger's stroke.

Fuel Value—Same as Metabolizable Energy.

Ful-cream Cheese—See Cheese.

Full Blood—In animal husbandry, a misnomer often applied to offspring of registered sire and dam. Correct term is "pure bred."

Full Fat Cheese—See Cheese.

Full Feed—All the feed an animal will consume, or at least all that is essential for that animal.

Full Mouth—The mouth of a mature animal in which all of the temporary teeth have been replaced by permanent teeth.

Fumigation—The process of exposing to fumes, vapor or smoke for the purpose of disinfecting or of destroying pests, insects and the like.

Functional Disease—A disease of which the symptoms cannot be referred to any organic lesion or change of structure.

Fungi—See Fungus.

Fungicide—Any substance that destroys fungi; also, one that inhibits the growth of spores.

Fungus—Any one of a group of vegetable organisms of a low order of development, multicellular and containing no chlorophyll, comprising the molds, mildews, rusts, smuts, mushrooms, toadstools, puffballs and allied forms.

Fuse—A wire, bar or strip of fusible metal inserted for safety in an electric circuit. Also refers to the process of reducing a solid to a fluid or melted state.

Fusible Plug—A plug usually attached to a boiler to safeguard the boiler against overheating due to a low water level. The body of the plug is generally of brass and its interior is bored out and filled with a metal, or alloy, which has a low melting point. When the plug becomes uncovered on account of low water, the low conductivity of the steam prevents the rapid withdrawal of heat from the fusible metal; consequently the temperature quickly rises above the melting point of the plug, causing the plug to melt. The escaping steam gives warning of the lack of water in the boiler.

Fusion—The melting together, by heat, of two or more metals.

Future Farmers of America, (FFA)—A national organization of farm boys studying vocational agriculture in the public high schools throughout the United States.

Futurity, (Show Ring Term)—All cattle futurities can be classed as dealing in the future with the potential show caliber of the animal in question. In most cases the futurity is run on the basis of nominating animals when they are young to be shown when they are older. At some livestock fairs it is required that the sire and dam be first nominated and later, the calf. All prize money is applied to the premium list for the futurity classes.

F. W. F. S.—Fat in the Water Free Substance, a term used in Australia in connection with cheesemaking.

G

Gauksäsi—See Cheese.

Galactans—The by-product of bacteria and one of the causes of ropiness in milk.

Galactase, Galactin—See Protease.

Galactagogue—A substance which stimulates the secretion of milk or of fat in milk.

Galactose—An aldo-hexose sugar which is stereo-isomeric with glucose. It crystallizes in microscopic hexahedra which melt at 168°C. It reduces Fehling's solution and is fermentable by yeast zymase. Lactose, the principal carbohydrate in milk, is a compound of galactose and glucose.

Gallon—A gallon of water contains 231 cu. in. or 8.3359 lb. in weight. Since milk is heavier than water, one gallon of milk average composition weighs about 8.6 lb. This is arrived at by the following formula:

Wt. gallon water \times Sp. gr. of milk =
Wt. of gallon of milk.

Ex: 8.3359 lb. water \times 1.032 specific gravity of milk = 8.60265 lb. milk.

2.15 lb. is generally accepted as the average weight of a quart of milk.

The British gallon is approximately one-fifth larger than the U.S. gallon, equalling about 1.20094 lb. more, or 10.323 U.S. lb.

See Table on Composition, Relation and Weights of Milk in Reference section, P. 285.

Gallons Per Minute—Abbreviated G.P.M. Measurement of fluid flow. One cubic foot per minute equals 7.48 United States gallons per minute. One cubic foot per second equals 448.83 G.P.M. One acre-inch per 24 hours equals 18.86 G.P.M.

Galloway—One of the beef breeds. Black is the characteristic Galloway color, however, a brownish and reddish tint often occurs in the black. The hair is long and curly. The breed is polled. They are smaller than the other beef breeds. The meat of the Galloway is of high quality.

This breed is known as good rustlers and is extremely hardy. Their native home is in the province of Galloway in Southwestern Scotland which is rough and mountainous and the climate moist and often chilly. Galloways were brought to America as early as 1853 and became most popular in the cool North Central states.

Gallup Number—See Butter.

Galton's Law—A somewhat misleading description of the contribution of various ancestors to the heredity of the individual, in which the two parents are credited with $\frac{1}{2}$, the four grandparents with $\frac{1}{4}$, the eight grandparents with $\frac{1}{8}$, and so on. Since the individual possesses a sample, chance half of the genes carried by each parent, knowledge of the heredity of more distant ancestors is of value only when the heredity of the parents is incompletely known.

Galvanize—The application of zinc plating, usually on iron, to protect it from rusting. Galvanized iron is unsuitable for milk equipment because of the imminent presence of damaging zinc salts.

Galvanometer—An instrument for detecting and measuring electrical currents. In its simplest form it consists of a delicately poised magnetic needle placed in a hollow coil of many wires. When an electric current passes through the coil, the needle is deflected. The amount of deflection varies with the strength of the current and is recorded by a pointer moving over a graduated scale. Named for Luigi Galvani, discoverer of current electricity.

Gama Grass—See Feeds and Feeding.

Gamete—A mature male or female reproductive cell.

Gametogenesis—The process by which mature sex cells are developed from the primordial germ cells.

Gammelost Cheese—See Cheese.

Gang Press, (in Cheesemaking)—See Cheese.

Garret—See Diseases in Cattle.

Garlic—See Feeds and Feeding.

Garlic Flavor—See Milk and Cream Defects.

Gas Development in Cheddar—See Cheese.

Gas Formers—Microorganisms which produce gas as an end product, and which cause milk to sour. The principal type species are non-spore-forming rods called *Escherichia coli* and *Aerobacter aerogenes*. Both of these types ferment glucose and lactose, forming acid and gas.

See *Escherichia coli* and *Aerobacter aerogenes*.

Gas Packing, (Milk Powder)—See Milk, Processing and Processing Equipment.

Gas Production, See Cheese—See Carbon Dioxide Poisoning (Silo).

Gas Production in Cheddar Cheese, (Normal)—See Cheese.

Gasket—A packing, usually in the form of sheets or rings, made of a variety of materials as rubber, metal, asbestos, etc., to be used between surfaces, as a packing in a water faucet, etc.

Gasoline Flavor—See Butter Defects.

Gassy—See Cheese Defects (Texture).

Gassy Fermentation—See Milk and Cream Defects.

Gastric Juice—The digestive juice of the stomach, containing the enzymes, pepsin and rennin, and hydrochloric acid.

Gastro-Enteritis—See Food Poisoning

Gate Pail, Gate Strainer—See Cheese

Gathered Cream System—A system of cream procurement whereby dairy farmers separate their own cream on the farm. The product is then gathered by cream haulers who deliver it to the central creamery for further making. In many cases farmers deliver or ship the cream direct to creamery.

Gathmann Process—See Milk Processing and Processing Equipment

Gauge, also Gage—A tool for scribing a line parallel to the edge of a piece of work. Also to measure size or capacity.

Gauge Pressure—The difference between the pressure inside a steam boiler and that of the air outside. It is measured by means of pressure gauge attached to the boiler.

Gaulin Homogenizer—See Homogenizer

Gautrat, Gavot Cheese—See Cheese

Gear—A toothed wheel when encased in a box it is called a gear box or transmission.

Gee—A command used in driving animals, usually signify to turn to the off-side, a turn to the right side.

Geheimrath Cheese—See Cheese

Gel—A term describing transparent or translucent bodies containing a considerable amount of liquid, but maintaining their shape and exhibiting rigidity, a jelly like structure.

Gelase—An enzyme which can hydrolyze agar agar.

Gelatin—A colloid derived by hydrolysis from the proteins collagen and ossein. It is prepared from calf skin trimmings, pork skin or bones. After suitable preliminary preparation according to the raw material used the prepared stock is heated in water and during this heating the collagen or ossein undergoes hydrolysis. As the hydrolysis proceeds the products formed become water soluble. The broth so obtained is filtered, concentrated and finally dried. The resulting product is gelatin. It is often used as a stabilizer in ice cream making.

Gelatin, Determination of in Dairy Products—See Dairy Tests

Gelatin Flavor—See Ice Cream Defects

Gelatin Liquefaction—The process whereby gelatinase, produced by a microorganism hydrolyzes gelatin. The end result is that the gelatin loses its power to solidify.

Gelatin Lumps—See Ice Cream Defects

Gelatin, Test for—See Dairy Tests

Gelatin Testing—See Laboratory Manual (Milk Industry Foundation)

Geld—To castrate, to emasculate, hence to spay. To render barren.

Gene—Chromatin material which is supposed to be the determiner (perhaps acting together with other genes) of a characteristic of the adult. In Mendelian terminology, a gene is a unit factor. During germ cell division the chromatin becomes stretched out into a long thread and at more or less regular intervals the thread exhibits dark-staining regions. In other words the chromosomes look like a string of beads. These beads are thought to be the genes.

Generator—A machine by which mechanical energy is changed into electrical energy, a dynamo.

Genetic—Pertaining to the beginning of anything or its mode of production or development.

Genetics—That branch of biology which provides the explanation of the similarities and differences between and among related animals or organisms. The science of heredity and variation from an evolutionary point of view. See Dairy Cattle Genetics in Handbook P 22.

Genital Organs—The external reproductive organs also called generative organs.

Genital Tract—In the female animal it includes the external opening (vulva), the vagina, the uterus (womb), cervix, Fallopian tubes and the ovary.

Genotype—An individual's constitution as regards the factors composing its germ plasma, the hereditary factors which it may transmit to its offspring.

Gentleman farmer—A term sometimes applied to a man of social position and wealth who farms mainly for pleasure rather than for profit.

Genus (pl. genera)—A category of classification ranking between the family and the species. See Class.

A group of closely related species of plants. In the classification scheme a genus may contain one or more species and a family may contain one or more genera.

Geology—The science which treats of the history of the earth and its life, especially as revealed in the rocks which are exposed to observation on the earth's surface.

Physical geology includes that part of the science dealing with the chemical composition of rock and the association of minerals to form different kinds of rock.

Geoponics—Pertaining to the study of tillage or cultivation of the soil. Also a book or discussion on agriculture.

Georgic, also Georgical—Relates to agriculture and rural affairs.

Geothermal, Thermal Gradient—The increase in the temperature of the earth from the surface downward, averaging about one degree F. for each 60 feet.

Gerilac, (Borden's)—Spray dried, low fat, high protein, modified milk product.

Germ—1. A microbe or bacillus. 2. A spore. 3. The primitive embryo.

Germ Cells—See Gamete. See also Germ Plasm.

Germ Plasm—The cell protoplasm which is the material basis of heredity and is transmitted from one generation to another.

Germ Theory—The theory that living organisms can be produced only by development from other living germ cells or germ plasm.

German Millet—See Feeds and Feeding.

German Silver—A white alloy containing nickel, copper and zinc. Although this alloy has been used in dairy equipment, it reacts with milk in much the same unfavorable way as does copper (cause of off-flavor). This, together with its higher price, makes its use for this purpose more prohibitive.

Germicidal Period—The first of four periods in the normal fermentation of milk. The period immediately following the drawing of milk from the cow, at which time there is no growth of bacteria but rather a decrease in their number. This action is thought by some to be the result of the grouping together of organisms and the subsequent appearance of a cluster of bacteria as one colony on agar plates, rather than to any germicidal property of the milk. However, most recent research seems to indicate no evidence of agglutination or bacterial destruction and the name "bacteriostatic" is suggested instead of "bactericidal"

or "germicidal" in referring to this phenomenon. It is thought that the substance responsible for the delayed growth of bacteria is a filterable heat-labile substance of natural origin, the purpose apparently being to restrain the growth of bacteria in the udder. It may be noted that the so-called germicidal property of milk seems to be of little importance in the preservation of milk. See Souring Period, Neutralization Period and Putrefaction Period.

Germicidal Power, (of Dairy Washing Materials)—Effectiveness in killing microorganisms.

Germicide—Any substance or agent which destroys germs or microorganisms.

See Antiseptic and Disinfectant.

Germinable—Capable of germination.

Germination—Growth or development of vegetation after the seed is planted; sprouting.

Gerome Cheese, Gervais Cheese—See Cheese.

Gestation—In cows, the period during which the unborn calf is carried; the time between conception and calving. The gestation period for cows is approximately 281 days.

Gestation Table—

Average Gestation Period

	<i>Weeks or Days</i>		<i>Extreme (days)</i>
Sow	16	112	109-120
Ewe	22	150	146-157
Cow	40½	281	240-311
Mare	48½	340	307-412

See Reference Section, P. 309.

Get—To beget; to procreate or bear as offspring.

Get of Dam—Offspring of one dam (cow). See Get of Sire.

Get of Sire—The offspring of one male and one or more females. In exhibition, number of animals in "get of sire class" may vary with species and breed of animals and show. Ownership of all animals is usually not required.

Gex Cheese—See Cheese.

Ghee—See Butter.

Giddap—A command to an animal to move; get up! gee up!

Gilcreas Phosphatase Method—See Dairy Tests.

Gill—4 oz liquid measure See Weights and Measures Reference section P 321

Gioddu (Caeddu)—See Fermented Milk

Girth—The measure around the body. A band or strap which encircles the body of an animal to fasten a saddle pack, blanket etc upon its back

Gisler Cheese, Gjetost—See Cheese

Glabrous, (Agronomy)—Smooth in the sense of not being hairy or downy. Opposite of pubescent

Glacial Till—Unstratified glacial deposits

Gland—An organ for secreting a substance to be used in or eliminated from the body

Endocrine Gland is a ductless gland. See Endocrine Gland

Exocrine Gland is a gland whose secretions are conveyed to the outside of the body by ducts the sweat gland

Glannerkase—See Cheese

Glass, Glassier or Glaesler—See Cheese Delects (Swiss)

Glass Enameled Steel, (Glass-lined Steel)—A metal used on dairy equipment especially tanks and holders. It is made by applying two or more coats of glass-enamel to high grade steel. It is not attacked by and has no action on milk or milk products. In composition it differs but slightly from glass. Its disadvantages are poor conductivity of heat for pasteurization and cooling, and liability to attack from strong alkalis. Tanks of this type are extensively used and are satisfactory

Glass State—A condition often found to exist in highly supersaturated solutions and characterized by a lack of crystallization. A solid solution. The lactose in most spray and roller dried milk products is in a glass state.

Glassware Cleaning Solution—A very satisfactory solution for cleaning glassware used in Babcock testing and other glassware is potassium chromate

Directions for the preparation of a chromic acid cleaning mixture vary considerably. A commonly used method is as follows. Add with the usual precautions 800 cc. of crude (technical grade) concentrated sulfuric acid to a solution made by dissolving 92 grams of technical grade sodium dichromate dihydrate in 4-8 cc. of tap water. When the cleaning solution has turned green or is

excessively diluted it is no longer useful and it should be discarded

Glaucous, (Agronomy)—Covered or whitened with a bloom powdery appearance.

Globose—Spherical

Globules—Small round particles, little globes. See Fat Globules

Globulin—A protein that is not soluble in water but is soluble in dilute salt solution. See Lactoglobulin also B Lactoglobulin

Gloucester—See Cheese.

Gluconic Acid—in the form of its sodium salt is being used widely to avoid calcium deposits

Glucose—Same as dextrose

Glues—A viscous substance much of which is obtained from boiling and concentrating to a state of jelly the skins bones and hoofs of animals

In recent years many glues have been made from casein

Glumse Cheese—See Cheese

Glutamic Acid— $\text{HOOC CH}_2\text{CH}(\text{NH}_2)\text{COOH}$. An amino acid found in the proteins of milk. Casein contains about 22.4 gms. and B-lactoglobulin about 19.5 gms. per 100 gms.

Gluten Feed, Gluten Meal—See Feeds and Feeding

Glyceride—An ester of the trihydroxy alcohol glycerol (glycerine) with one (mono) two (di) or three (tri) fatty acids. Naturally occurring fats and oils are mixtures of various triglycerides

Mono- and Di glycerides are employed as emulsifying agents

Glycerolate—The process of adding glycerol to the semen-extender (diluter) mixture.

Glycerolating Medium—That portion of the semen diluter (extender) which contains glycerol.

Glycine— $\text{CH}_2(\text{NH}_2)\text{COOH}$. One of the amino acids found in milk proteins. Casein contains 27 gms of glycine per 100 gms. B-lactoglobulin 14 gms per 100 gms.

Glycolysis—The conversion of lactose to lactic acid during and after manufacturing of all cheese varieties. One of the primary biochemical changes in cheese ripening

Glycoprotein—A protein which is combined with a carbohydrate. It is not known definitely whether or not such proteins exist in milk.

Glymol—High grade white mineral oil colored red with alkanet root or oil red. A few drops of glymol are introduced into the neck of the test bottles just before reading when making a Babcock test on cream. The glymol levels the upper surface of the fat column and makes possible an accurate reading of the test.

Gnat—Any of various small insects or flies.

Goad—A pointed stick or rod used to urge on animals.

Goaf—A mow of hay or grain, laid up in a barn.

Goat—Any of certain hollow-horned ruminants closely allied to the sheep, but differing considerably in external characters and habits, being of lighter build, with backwardly arching horns, which are present in both sexes.

Among the principal breeds and types of goats are the Saanen, Toggenburg, Nubian, Alpine, Murcian, Norska and the American goat. Of these the Saanen and Toggenburg are the most prominent in the United States at the present time.

See "Milk Goats" in Handbook, P. 240.

Goat Flesh—The edible meat of the goat. Also called Chevon.

Goat Milk—See Milk and Cream.

Goats, Milk—See "Milk Goats" in Handbook.

Goat's Milk Cheese—See Cheese.

Goat Publications—See P. 330.

Goiter—See Diseases in Cattle.

Goitrogenic Area—An area or section of the country in which the soil is deficient in iodine and therefore food and feed products grown in this area are also deficient in this element. Since iodine is necessary to the proper functioning of the thyroid gland in man and animals, the lack of it seems to induce goiters, an enlargement of the thyroid gland, in humans.

Gold Medal Cows—An award given to an owner of a Jersey cow that has produced a given amount of butterfat in 305 or 365 days by the Jersey Breeders Association. The cow must produce 610 lb. of butterfat in 305 days or 700 lb. of butterfat in 365

days and must have met certain calving requirements in both cases.

Gold Number—An expression of the protective ability of an emulsoid over a suspensoid. The gold number is the number of milligrams of the emulsoid which, when added to 10 cc. of red gold suspension, will just prevent the change to blue gold sol on the addition of 1 cc. of a 10% sodium chloride solution.

Golden Crest Milk, (Borden's), Golden Guernsey Milk—See Milk and Cream.

Golden Millet—See Feeds and Feeding.

Golden Whip, (Borden's and Whitson's)—Blend of dried egg yolk and modified milk protein for baking and ice cream manufacture.

Goliath, Gomost—See Cheese.

Gonads—The glands which produce the reproductive cells; an ovary, testis, or hermaphrodite gland.

Goober—The peanut. See Feeds and Feeding.

Good Grade Beef—See Beef Carcass.

Goods—In marketing, wares; commodities; chattels.

Goosemouth—The oddly shaped mouth of an animal causing the upper lip to hang over the lower.

Gooseneck—Anything curved like the neck of a goose; as, gooseneck clamp.

Gopatis—Lord of the cows. A term used 3500 years ago by the Aryans of Central Asia to designate their brave warriors whose business it was to guard the food supply which was largely milk. Gopatis means herdsman or dairyman.

Now an honorary society including in its membership many who have made distinguished contributions to the field of dairy industry.

Gorgonzola, (Standards)—See Cheese.

Gossypol—A dark colored and fat soluble, poisonous substance occurring in small amounts in raw cottonseeds, the amount varying with climate and soil conditions. Gossypol is poisonous to certain kinds of animals if consumed in sufficient amounts. In the heating process of manufacture into feeds and foods, most of the gossypol is changed into a much less poisonous sub-

stance called D gossypol. Recent feeding experiments have shown that no definite poisonous effects are produced especially when cottonseed meal is combined with other grains and other feeds such as used in the dairy grain mixture.

Gore—To make a wound to pierce with the horns or tusks as a bull or boar.

Gouda, (Standards)—See Cheese.

Gournay Cheese—See Cheese.

Governor—An attachment to an engine compressor or other machinery needing speed control which regulates the flow of the working fluid.

Govers Milk Drier—See Milk Processing and Processing Equipment.

Goya Cheese—See Cheese.

Grab—An instrument or device for clutching objects as for hauling or hoisting them.

Grade—An animal having one half or usually more of the blood of a particular breed but is not a purebred. When the proportion of pure blood is large the animal is called a "high grade" and when it is low it is called a "low grade."

To arrange animals in groups or classes as in judging contests according to size, age, etc.

A classification based on the several factors determining quality such as grades of hay, corn, and small grains.

Also to level off or to build up to a certain level or levels as in making a roadbed, a slope on land to prevent erosion.

Grade A Pasteurized Milk, Grade A Raw Milk, Grade B Pasteurized Milk, Grade B Raw Milk, Grade C Pasteurized Milk, Grade C Raw Milk—See Milk and Cream.

Grade of Milk—A quality or class of milk which meets certain requirements viz Grade A Milk, Certified Milk, etc. See Grade A Milk also Certified Milk.

Graded—Improved by crossing with a better sire.

Grader—See Cheese.

Grades—In marketing animals or other products a grade is a subdivision of a subclass and is probably the most important grouping. Grades are based upon form, finish, and quality and in order to grade high an animal must be superior in all of these

respects. Grades commonly used are prime, choice, good, medium, common, and cull, varying somewhat with the kind of live stock being described.

Grades of Cheese—See Cheese.

Grades of Cheese, (Canada)—See Cheese.

Grades of Milk—See Milk and Cream.

Grade Up—To improve as native stock by breeding the females generation after generation to purebred males.

Grading—In livestock, the mating of a purebred sire with a scrub cow.

Grain—The seed or seedlike fruit of any cereal grass as wheat, corn, oats, rice, millets, etc.

The direction, arrangement, or appearance of the fibers in wood, of strata in stone, etc., an annual ring.

Coarseness or fineness of an abrasive expressed by a preceding number.

Grain Aphid—An aphid injurious to grain, especially English aphid, widespread in the United States on various grains and grasses.

Grain Beetle—Any of several beetles whose larvae feed on and destroy stored grain.

Grain Borer—Any insect or larva which bores in grain.

Grain Drill—An implement for sowing the seeds of cereals or grasses.

Grain Elevator—A building for elevating, storing, discharging, and sometimes processing grain. A device for moving grain from one place to another by means of an endless belt or chain conveyor with scoops or buckets for raising the grain.

Grain Smut—A disease of cereal grasses caused by fungi of the genus *Ustilago* and *Urocystis*.

Grain Sorghum—See Feeds and Feeding.

Grain Weevil—Any of various small insects destructive to stored grain. Of these the granary weevil and rice weevil are true weevils.

Grainy, Gritty, Lumpy, or Sandy—See Cheese Defects (Body-Cheddar).

Grainy Sediment—See Dried and Evaporated Milk Defects.

Gram—1 gram = 0.035 ounce (Avoirdupois) or 0.032 (Troy).

Gram Negative—Bacteria which lose the initial stain of the gram stain and are decolorized so that they take the final stain and appear red.

Gram Positive—In bacteriology, a term used to indicate a staining reaction of certain organisms. The ability of an organism to retain the gentian violet gram stain after it is decolorized with 95% alcohol is referred to as gram positive. Those organisms which cannot retain the stain are known as gram negative. A statement as to the gram staining characters of an organism is practically always included as a part of its description.

Gram Stain—Smear material to be examined on a glass slide, dry and fix with heat. Stain with gentian violet for 1 minute. Wash with water. Stain with Gram's iodine for 1 minute. Wash with water. Destain with 95% ethyl alcohol for $\frac{1}{2}$ minute. Wash with water. Stain with 1% saponin for 2 minutes. Wash with water, dry and examine. Gram positive organisms are dark violet or purple; Gram negative are light pink.

Gramicidin—See Antibiotics.

Grana Cheese—See Cheese.

Granary—A place where grain is stored after it is threshed or husked.

Granary Weevil—A small brown snout beetle which lays its eggs in the kernels of stored grain, the larva developing inside the kernel.

Grand Champion—The most outstanding individual of each breed and sex in a show; as the grand champion Holstein bull which is the animal that more nearly approaches the ideal type of the breed than any of its competitors.

Grange—One of the lodges of the "Patrons of Husbandry", a secret organization or association of farmers or farmer-minded to further their interest, and particularly to bring producers and consumers, farmers and manufacturers into direct commercial relations. The national association was organized in 1867.

Granger—A member of the Grange; a farm steward; often a farmer.

Granular Curd Cheese, Granular Cheese, (Standards), Granular Process—See Cheese.

Granulation—The binding together of soil particles into aggregates or clumps through the effect of flocculation or aggregation.

Grass—A plant belonging to the family *Gramineae*, generally herbaceous, including the small grain cereals, corn, sorghum, and the common pasture and turf grasses. It is distinguished by its jointed stems (culms), sheathing leaves, flowers born in spikelets of bracts (glumes), and fruit of a seedlike grain.

Grass Cattle—Generally meaning grass-fed cattle.

Grass Silage, Grass Sorghum—See Feeds and Feeding.

Grasser—A beef animal marketed directly from pasture without supplementary feeding.

Grassland—Land which is kept in grass; permanent pasture or meadowland. See "Forage—The Crop of Rising Importance" in Handbook, P. 227.

Grassland Farming—A system of farming in which the raising of grass for the grazing and feeding of livestock is the predominant factor.

Grating Cheese—See Cheese.

Gravimetric Test—See Dairy Tests.

Gravitational Water—Water which drains downward from soil under the force of gravity. Free water.

Gravity—The attraction of bodies toward the center of the earth. Under the influence of gravity alone (no air resistance) all bodies at the same place fall to the earth with the same acceleration. The acceleration increases slightly with latitude and decreases with elevation above sea level. Its value at the level of the sea in the latitude of New York is 32.16 feet per second. Not to be confused with specific gravity, or Baumé gravity, both defined elsewhere.

Gravity Air Hardening Room—A type of ice cream hardening room in which the expansion coils are arranged in tiers near the ceiling with sloping baffles below them. The baffles are so arranged that the heavier cold air flows downward along the slope of the baffles until it escapes at the lower edges and settles down through the room. The warmer air, being lighter, is displaced by the cold air; the warm air rising and flowing upward along the lower side of the sloping baffles until it enters the coil area where it is chilled. Thus a definite circulation is set up.

Gravity Brine Refrigeration—A method of natural refrigeration in which brine is circulated through a continuous system of pipes by force of gravity. The brine is first cooled by passage through an overhead tank of salt and ice. From there it descends through the lower portion of the coils to the room to be cooled. There it takes up the excess heat and, becoming lighter, is forced up into the salt and ice tank again by the cooler and heavier brine thus making a complete circulation. This system is also known as the Cooper brine system.

Gravity Cream—See Milk and Cream

Gravity Separation—See Milk Processing and Processing Equipment

Gravity System—A system of handling milk in milk plants whereby the milk during processing flows by gravity from one machine to the next through the plant.

Gray Cheese—See Cheese

Graze—To feed on growing crops or pasture grass.

Grazing Methods—In recent years much attention has been given to methods of grazing. Overgrazing contributes much to ruining the efficiency of pastures, under grazing with some grasses also has undesirable results.

Among methods of grazing are 1) Continuous grazing 2) Alternate grazing 3) Hohenheim system 4) Strip grazing 5) Zero grazing. These various systems are described alphabetically.

Grease Butter—See Butter

Grease Trap—A small, tight cistern, usually made of concrete, through which waste products in a dairy must pass. Its purpose is to free the waste water as nearly as possible of any fat which it might contain and which might clog the sewage filters.

Greasewood—See Feeds and Feeding

Greasy Curd—See Cheese Defects—(Body Cheddar)

Greasy Texture—See Butter Defects

Green Cheese, Green Flavor—See Cheese

Green Manure—A herbaceous crop often legumes, plowed under while green for the purpose of enriching the soil, especially through the addition of organic matter. Sometimes the green crop is sown with spring grains and plowed under in the fall. Fresh or undecayed stable manure

Greensand—A mineral which is a hydrous silicate of iron and potassium. Used as an ion exchanger. See Zeolites.

Gregarious or Gregariousness—Tending to flock or herd together; opposite of solitary or living alone.

Grinder—A machine for grinding with abrasives, used to cut hardened or tempered metals, and to put a smooth finish on woods, metals, etc.

Grinder Cheese, Grinding Grip, (in cheese making)—See Cheese

Grit—See Feeds and Feeding

Gritty Process Cheese—See Cheese Defects.

Gritty Salt—See Butter Defects

Groats—See Feeds and Feeding

Grooming—The brushing, currying and cleaning of an animal for appearance and sanitary or other reasons. A daily grooming of dairy cows is necessary especially in winter in order to remove dirt and loose hair from the cows for producing clean milk. It keeps the skin clean and stimulates circulation, thus making the hide and hair smoother and more pliable.

The suggested equipment for grooming is a currycomb and a heavy bristle brush. Recently, electric revolving brushes are on the market and have proved satisfactory except when used on wet areas.

Also important for fitting animals for the show ring.

Gros Lait—See Fermented Milk.

Ground Corn, Ground Corn and Oats, Ground Feed—See Feeds and Feeding

Group Project, (Agriculture)—A project in vocational agriculture, conducted by a number of pupils under the supervision of an instructor. See Project, Agricultural.

Grouting Materials—In dairy construction grouting material is used for joining pieces of tile. There are two types of materials, both acid proof and not affected by cleaning compounds or boiling water because they are nonporous and chemically inert. A plasticized sulfur compound is poured hot into the tile interspaces. Phenolic resin is used as a cold mortar and hardens very quickly.

Grubs, (Warbles)—The thick worm-like larvae often found underneath the skin in cattle. The maggots of the Heel Fly.

See Diseases in Cattle.

Gruel—A light liquid food, made by boiling any meal in water or milk, as for calf feed.

Grünerkäse Cheese, Gruyère, (Standards)—See Cheese.

Guaiaac Test—See Dairy Tests.

Guano—A material found in certain areas frequented by sea fowl and in caves frequented by bats, and composed chiefly of their partially decomposed excrement. It is rich in phosphates, nitrogenous matter, and other material for plant growth, and has been used extensively as a fertilizer.

Guernsey—A breed of dairy cattle originating in the Channel Islands near the northern coast of France. Mature cows weigh from 800 to 1400 lb. and the bulls from 1200 to 2200 lb. Their color is fawn and white with fawn predominating, and the skin is characteristically yellow. In yield of milk and its fat content the Jersey and Guernsey are not far apart, the Guernsey producing slightly more milk which tests about 5% fat. The milk is generally of a very rich color. See Handbook, P. 261.

Guide Plates—Special glass or cardboard guides, 2 x 4½ inches in size with 16 square or circular areas which cover 1 sq. cm. each. They are useful in preparing the smears of milk for staining in direct microscopic examination of bacteria.

Gully—A ravine or ditch caused by the eroding and cutting action of water erosion.

Gum—An amorphous, tasteless substance, exuded in most cases by plants and hardening on exposure to air, its chief constituent being carbohydrates. Gums are used to a small extent as stabilizers in ice cream, sherbets, and ices. They have the property of absorbing water in large amounts and their action is fundamentally like that of gelatin. Water so held will produce smaller ice crystals than free water and give a smoother texture. They possess the disadvantage of making the product gluey, gummy, and elastic. Some of the gums used are gum tragacanth, gum arabic, and India gum. Gums are also produced by bacteria from the fermentation of lactose to galactin or dextrin. When this occurs, the milk is oftenropy.

Gum Arabic—A gum obtained from *Acacia*, and used to some extent as a stabilizer in ice cream and in certain varieties of candy.

Guro Bassora—An amorphous carbohydrate, existing in many plants which have the property of taking up water to form thick viscid products. Same as India Gum. Sometimes used as a stabilizer in ice cream or sherbets. Also known as Karaya Gum.

Gum Guaiac—A gum sometimes used as a stabilizer in the manufacture of ice cream and sherbets. It comes from the stems of the *Guaiacum officinale*, a tree which grows in Jamaica and other West Indian Islands.

Gum Tragacanth—A gum often used as a stabilizer in ice cream and sherbet manufacture. It is an exudation from the *Astragalus verus* tree which grows in Armenia and Persia. It swells up in water, half being soluble; the other part, consisting of starch, etc., also dissolves, or mostly so, upon boiling.

Gummy Body—See Ice Cream Defects and Butter Defects.

Gummy Texture—See Ice Cream Defects.

Gums—See Cheese.

Güssing Cheese—See Cheese.

Gutter Cleaner, (Mechanical)—Gutter cleaners or manure cleaners are mechanisms designed to clean the manure from the gutters in the barn by mechanical means. There are various kinds but in general they consist of an endless chain with scrapers attached which run in the gutter and drag the manure to an outside pile, pit or truck.

Gutter Drains—Drains built in the floor the length of the rooms and covered with an iron grill. Such drains are not entirely satisfactory because they are difficult to clean. Open drains near outside walls are more satisfactory if floor slopes gently toward the drain. Thus the floor of the working space will be dry.

Gynolactose—Refers to a sugar present in human milk.

Gypsum—Calcium sulfate. A natural soil dressing commonly found in deposits or mines, used where it is desired to add calcium to the soil without noticeably raising the soil pH. Land plaster. Also Plaster of Paris.

H

Haecker Feeding Standard—See Feeds and Feeding

Haemolysis—The destruction of red corpuscles often by certain streptococci bacteria

Haemolytic Streptococci—Bacteria causing certain diseases such as sore throat scarlet fever mastitis and others

Harry Vetch—See Feeds and Feeding

Half and Half—See Milk and Cream

Half Fat Cheese—See Cheese

Hall Test—See Dairy Tests

Halogen—A non-oxygenated substance such as chlorine bromine iodine which by direct union with metals forms salts See Iodine Number

Halphen Test—A chemical test for detection of cottonseed oil. It is dependent upon a color reaction with amyl alcohol carbon disulfide and 1% sulfuric acid.

A.O.A.C. gives the following method Mix CS₂ containing 1% of S in solution with equal volume of amyl alcohol Mix equal volumes of this reagent and sample under examination and heat in bath of boiling saturated NaCl solution for 12 hours In presence of as little as 1% cottonseed oil pronounced characteristic red or orange red is produced Depth of color is proportional to certain extent to quantity of cottonseed oil present and comparative tests with known mixtures of cottonseed oil will give approximation of quantity

Hammer Mill—A machine for grinding feed in which the grinding process is performed by several rows of thin steel hammers revolving at high speed

Hammersten's Protease—A protein like material remaining in whey after coagulation of the casein of milk with rennet It comprises about 4% of the total casein. It is uncertain at present whether this fraction is present as such in the original milk or is a product of the action of the enzyme

Hand—A measure equal to a hand's breadth or four inches chiefly used in measuring the height of animals

Hand Cheese—See Cheese

Handling Room—A room in a milk plant in which the market milk is handled and in which are located the clarifier, pasteurizers coolers fillers and cappers In some plants the bottle filling department is in a room separated from the rest of the handling room

Hanus Method—A method for determining the iodine number of fats and oils by means of a solution of iodine monobromide (I Br) See Iodine Number

Haploid—A term used in genetics to indicate the usual chromosome number occurring in the gametes (mature sex cells) in which only one member of each chromosome pair is present one half the diploid number See Diploid

Haptogen Membrane—A film formed on casein solutions which have been heated to a temperature above 40°C (104°F) This film resembles the film formed on heated milk is insoluble in water but soluble in alkali solutions

Hard Water—Water containing an excess of mineral salts such as calcium magnesium and iron compounds usually over 20 grains of solids per gallon Such water when used in dairy plants often results in mineral deposits on the equipment so-called boiler scale sludge and thus reduces the effectiveness of washing powders used in cleaning the equipment The deposits of scale also reduce the effectiveness of heat transfer both in the boiler and other equipment. There are two kinds of hardness

1 Permanent hardness usually caused by calcium magnesium and iron sulfates. These are precipitated by high temperatures (300°F or above) and form a hard scale

2 Temporary hardness caused by presence of carbonates of these metals which are precipitated at 212° F The carbonates form a soft precipitate and are responsible for much of the accumulation of sludge

By proper treatment hard water can be made soft and thus the accumulation of sludge in dairy equipment can be avoided. Reliable chemical firms dealing in water softening compounds should be consulted for such water treatment

Hardness is expressed as parts per million or grains per gallon of calcium carbonate or its equivalent See Soft Water

Harden Off—To accustom to cold or other unfavorable environmental conditions by gradual exposure to lower temperatures or other unfavorable conditions.

Said of seedlings grown in hot or cold frames—to prepare them for transplanting to open plots.

Hardened Fat—See Hydrogenated Fat.

Hardening, (Ice Cream) with Ice and Salt,

Hardening, (Ice Cream) Factors Affecting Time, Hardening Cabinets, Hardening Process—See Ice Cream.

Hardening of Udder—See Diseases in Cattle.

Hardening Room—A heavily insulated, refrigerated room for the hardening and storage of ice cream after it is drawn from the freezer. The temperature of hardening rooms commonly varies from 0° to -40° F.

Hardening Rooms, Hardening Tunnels—See Ice Cream.

Hardness of Water, Test For—See "Standard Methods For Examination of Water" in American Public Health Association publication, 9th edition.

Hardpan—A type of soil material formed and compacted into a layer impervious to the free passage of water.

Hardware Disease—See Diseases in Cattle.

Harland-Ashworth Method—See Dairy Tests.

Harmless Alkali—Any one of a number of alkalies commonly used to neutralize acid cream. These alkalies contain the same minerals as are found in normal milk, and can be used in small quantities without harmful effects. Some state laws prevent their use. See Neutralizers.

Harmozone—One of a class of hormones which stimulates growth and development in animals. An internal secretion which influences growth and nutrition. See Hormone and Antacoid.

Harness, Harp, Harping—See Cheese.

Harris Rennet Test—See Dairy Tests.

Harrow—Toothed implement used in seed-bed preparation for breaking up clods and firming and smoothing plowed land. There are several makes in the market, among them being 1) Disk Harrow 2) Spike-Tooth Harrow.

Harrow, Disk—A power-drawn farm implement for smoothing plowed land and cutting thin sods, consisting of a number of revolving disks on an adjustable horizontal axle.

Harrow, Spike-tooth—A leveling implement on the farm for smoothing the soil, composed of a number of spikes set at an angle on a frame in a manner permitting scratching the soil as the implement is dragged along. Also known as a drag harrow.

Hart Cheese—See Cheese.

Hastener, (English) in cheesemaking—See Cheese.

Hatmaker Process—See Milk, Processing and Processing Equipment.

Haukase—See Cheese.

Hay—See Feeds and Feeding.

Hayband—A twist of hay used to bind a bundle of hay (primitive); sometimes, a wire for binding hay.

Hay Cheese—See Cheese.

Haycock—Used to denote a conical pile of hay.

Hayfork—A hand fork for pitching hay. A mechanically operated fork for loading or unloading hay. An attachment on a hay tedder which stirs the mowed hay.

Haying—The process of cutting, and curing grass for hay, and then harvesting it.

Hayloft—A loft in the barn for storing hay.

Haymow—A mass of hay.

Hayrack—A frame mounted on the running gear of a wagon, and used in hauling hay, straw, sheaves, etc.; hay rig and hay rigging.

Haystack—A heap or pile of hay, sometimes thatched for preservation in the open air.

Hayssen Wrapper—See Cheese.

Hay Sweep—A device used in the field with straight horizontal wooden teeth to gather hay either from a swath or windrow.

Haywire—The wire used to bind a bale of hay or straw.

Head, (Agronomy)—A compact, ball-like, flower cluster in which the flowers arise directly from a very short axis.

Head—The anterior division of a vertebrate animal including ears eyes nose etc. To get in front of to hinder to stop or to turn back as to head a drove of cattle

Head Pressure—The discharge pressure in the high pressure side of a mechanical refrigerating system or pump

Health of Cows—See Articles in Handbook Section See Diseases in Cattle and their Prevention P 217

Heart—The hollow muscular organ which by contracting rhythmically keeps up the circulation of the blood

Heat—Basic form of energy measured in B.t.u., calorie etc., including among others "sensible" heat which is associated with a temperature change "latent heat associated with change of state at constant temperature as water to ice at 32°F., and water to steam at 212°F., and heat of reaction associated with chemical changes as combustion in an engine

Sexual excitement especially in the female of mammals the time or duration of such excitement hence the period during which the female will accept service by the male Estrus.

Heat Exchanger—A piece of regenerative equipment used in milk plants for preheating incoming cold milk and pre-cooling outgoing hot milk. The exchanger is usually a self-contained unit consisting of two or more heavy metal plates enclosing a thin partition plate held rigidly and centrally between which flows the thin film of hot milk against the under surface of the partition plate counter-current to a thin film of cold milk (or water) flowing over the upper surface of the partition plate. This system effects a quick milk-to-milk regeneration or heat exchange. See Regeneration

Heat Expansion—Most materials expand when heated or cooled. Allowance must be made for this in the planning and operating of a dairy plant. See P 35

Heat Labile—In chemistry and physics readily undergoing change in molecular arrangement with change in temperature

Heat Lamp Moisture Test—See Dairy Tests.

Heat Resistant Count—A bacterial plate count obtained from milk which is pasteurized under exacting control in the laboratory. This is done to determine with some accuracy the heat-resisting organisms that

may infect an individual supply of raw milk. A high count is strongly indicative of improper milk production and handling

This count may also be conducted in the regular fashion by obtaining vat pasteurized milk and plating out under specific conditions which will help show up the thermophilic or thermotolerant (heat resistant) organisms that may come from improperly pasteurized milk or unclean plant equipment

Heat Sealing—See Cheese

Heat Shock—See Ice Cream Defects

Heat Stability—The ability of cream and milk to withstand high temperatures without exhibiting a tendency to "feather" or curdle

In evaporated milk sterilization chemical additives are permissible for controlling coagulation due to heat

Heat Transfer Of Some Common Materials—See Reference Section of Handbook P 326

Heated Flavor—See Milk Defects

Heated Milk, Test For—See Dairy Tests.

Heaving—The lifting action exerted by the soil during the winter under the influence of alternate freezing and thawing

A type of winter injury in which plants are loosened and frequently lifted from the soil as a result of successive freezing and thawing

Heavy Body—See Ice Cream Defects

Heavy Cream—See Milk and Cream

Heavy Soil—A soil that is hard to till. Generally a soil that contains much clay

Hedge—In marketing, to make a transaction which offsets another. For example when a cash grain buyer hedges he sells a corresponding quantity of futures. The fluctuation in the price of one tends to offset the changes in the price of the other

Heel In—To cover the roots of a plant with soil temporarily

Hegari—See Feeds and Feeding

Hehner Number—The percentage of the fatty acids of a fat that are insoluble in boiling water

Heifer—A female calf or young cow, usually one that has not produced offspring, although the name is often applied to young cows in milk, as a two-year-old heifer, and for each age up to five years.

Held Butter—See Butter.

Hemo, (Borden's)—Vitamin-mineral fortified chocolate flavored food drink.

Hemolytic Streptococci—Bacteria which secrete a substance called hemolysin which destroys red blood corpuscles by eroding the cell wall and thus liberating the hemoglobin of the cells. This action is called hemolysis or laking. *Hemolytic streptococci* occur as spherical bacteria grouped in chains. They are pathogenic to man, causing many diseases, notably septic sore throat. *S. hemolyticus* and *S. pyogenes* are common type organisms and occur in infected udders of cows.

Hemorrhagic Septicemia—See Diseases in Cattle.

Hemp Seed Oil Meal—See Feeds and Feeding.

Herbage—Herbaceous vegetation; green plants collectively, especially those used for pasturage.

Herbivorous, (animals)—Those animals which habitually rely upon plants and plant products for their food, as contrasted with carnivorous animals which live primarily on meat.

Herd—A number of cattle, or other large animals, assembled together in a definite group.

Herd Book—A book of records containing a systematic entry of registered cattle, their ancestry and performance. These records are made accessible to the public and are published by the various individual breed associations.

A permanent record, kept by a supervisor of a Dairy Herd Improvement Association.

Sample record books can be secured from the Dairy Husbandry Research Branch (USDA) Washington 25, D.C.

Herd Improvement Registry, (H.I.R.)—A milk and butterfat record of a herd of pure bred dairy cows, taken and kept by a representative of an agricultural college or experiment station in co-operation with a

breed association. This representative is usually referred to as a "cow tester" or "milk tester." The tester weighs, samples, and tests milk for butterfat once a month. Herd Improvement Registry differs from Advanced Registry testing in that it includes the whole herd, and differs from Dairy Herd Improvement Association testing in that only pure bred cows are included. See Advanced Registry Testing; Dairy Herd Improvement Association; Herd Test.

Herd Replacement—In selecting heifers for the dairy herd, the butterfat yield of dams and the proven record of sires are of great importance. It is desirable to select large, growthy, healthy heifers capable of beginning their milk producing functions at as early an age as possible. They should be chosen as far as possible from disease free herds, preferably from the owner's herd. If purchased, every effort should be made to get replacements from high producing cows, sired by proven bulls, and as far as possible from disease free herds, and, as a precaution, to have them checked, tested and vaccinated by a responsible veterinarian.

Herd-Sire Record—A record of all information concerning a bull, including his name, registration number, sire and dam, daughters, their production records and all other pertinent information.

Herds-Grass—See Feeds and Feeding.

Herd Test—A breed association test which requires that all the producing cows in a herd be tested for milk and fat production. This test differs from the Advanced Registry, Registry of Merit, Register of Production Tests in that in these last named, the breeders are privileged to select the cows to be tested for production. The production of cows which have previous records of production and cows which have lost one or two quarters is omitted in the herd average.

The Ayrshire Breeders Association's test is the same as the Advanced Registration Test, except that no preliminary milking is required, three cows can be milked at one time, and parts of two lactation periods may be included to make up herd test year's production. See Advanced Registration Testing, Advanced Registry Herd Test and Official Record.

Hereditary—Capable of transmitting physical and psychical characteristics of a parent to an offspring. The reappearance of ancestral traits.

Hereford—The Hereford are the dominant beef breed of the U.S. most easily recognized by their white face. The Hereford color is a medium rich red and a characteristic white face. The white color is also found on the underline, flank, crest, switch, breast and below the knees and hocks. This breed is often known as the "white face" cattle. In weight the Hereford is only exceeded by the Shorthorn. The Hereford breed originated in England in the county of Hereford.

Herkimer Cheese—See Cheese

Herman Stier Acceleration Type Vacuum Pan—See Milk Processing and Processing Equipment

Hermaphrodite—An individual having both male and female reproductive organs. In higher vertebrates this is a rare condition and the organs and function of one or both sexes are generally imperfectly developed.

Hermetically Sealed Butter—See Butter

Herrgardost Herve—See Cheese

Hessian Fly—A small two-winged fly which is very destructive to wheat in America unless properly controlled by late plowing and by other methods suggested by entomologists.

Heterosis—The increased stimulus for growth and vigor often exhibited by the crossbred individual hybrid vigor.

Heterotrophic—Capable of deriving energy for life processes only from the dissimilation of organic carbon compounds and incapable of using carbon dioxide as the sole carbon source for cell synthesis.

Heterotypic Division—Generally the first or reduction division of meiosis in which homologous chromosomes are separated into different cells. See Meiosis.

Heterozygote—An individual which has resulted from the fusion of gametes carrying allelomorphous genes.

Heterozygous—A term used to describe a condition in which the homologous chromosomes carry dissimilar genes.

Hide—The skin of an animal either raw or dressed commercially applied to the undressed skins of full-sized steers, cows, etc.

Hidebound—Animals having the skin adhering so closely to the ribs and back as not to be easily loosened or raised.

High Acid Flavor—See Milk and Cream Defects

Highbred—A term applied to an animal of superior breeding.

High Colored Cheese—See Cheese and Cheese Defects

High Fat and High Serum Solids Ice Cream
High Fat Ice Cream—See Ice Cream.

High fed—Well fed or luxuriously fed.

High Flavor—See Ice Cream Defects

High Grade—An animal possessing seventy five per cent or more of the blood of one breed. See Grade.

"High Lights of Milk Processing"—See Handbook, P. 54

High Melting Resistance—See Ice Cream Defects

High Pressure Side—The condensing and compressing section of the vapor circuit in a compression system refrigerator. The vapor in the circulatory system is compressed into this section by a pump. It is then condensed and liquefied after which it passes through a valve into the expansion side where it removes the heat from whatever it contacts as it again vaporizes.

High Serum Solids Ice Cream—See Ice Cream

High Side—See High Pressure Side

High Speed—Capable of being used at high speed operated or adapted for operation at high speed.

High Temperature, Short time Pasteurization—See Milk Processing and Processing Equipment

High test—A relative term used in milk testing germination test time and fertilizer analysis, etc. A test which is above the average for the particular thing being tested. Example: a 4% fat test for Holstein milk may be high for that breed yet a low test for the Jersey breed.

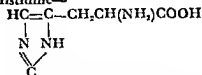
Hill Test for Soft Curd Milk—See Dairy Tests

Hippe—See Fermented Milk

Hippuric Acid— $C_6H_5 \cdot \overset{O}{\parallel} NH \cdot CH_2 \cdot COOH$
Benzoyl glycine. An acid present in the urine of herbivorous animals. Also present in milk to the extent of 30-60 mgms. per liter.

H. I. R.—See Herd Improvement Registry.

Histidine—



An amino acid found in the proteins of milk. Casein contains about 3.1 and B-lactoglobulin about 1.6 gms. per 100 gms.

History of Dairying—See "The Importance of the Dairy Industry" a Danish publication and "History of Dairying" by T. R. Pirtle and published by Mojonnier Bros. Co.

History of Ice Cream—See Ice Cream. See also "Ice Cream Manufacture" in Handbook, P. 165.

Hobble—A fetter for a cow or other animal.

Hock—The tarsal joint in the hind leg of a quadruped, as the cow. It corresponds to the ankle of man, but is elevated and bends backward. It is a compound joint, and contains several small bones. It is the joint between the thigh and the shank in fowls.

Hog Millet—See Feeds and Feeding.

Hohenheim Cheese—See Cheese.

Hohenheim System—A system of intensive pasture management, which originated in Germany during World War I. It is based upon four distinct principles: 1. Division of pasture area into plots. 2. Use of concentrated fertilizers. 3. Rotational grazing. 4. Combination of grazing and hay land.

Holders—See Milk, Processing and Processing Equipment.

Holding Chute—A special stall for holding cattle when blood samples are being taken, or when cows are being dehorned, treated for disease or for any other purpose when the animals should be held securely.

Holding Order—See Cheese.

Holdovers—In marketing, stock not sold on day of arrival, carried over.

Holes in Cheese—See Cheese.

Holland Cattle—The Holstein-Friesian breed and the Dutch Belted breed of dairy cattle both originated in Holland.

Holocellulose—Total structural carbohydrate in the plant. It excludes soluble sugars, starch, and pectins.

Holophytic—Said of microorganisms which take in their foods only in solution through their cell walls; like a vegetable.

Holozoic—Said of microorganisms which ingest their food in particulate form; like an animal.

Holstein Health Cheese—See Cheese.

Holstein-Friesian—A large breed of dairy cattle, black and white in color and originating in north Holland and Friesland. The breed is very old; excels in quantity of milk produced (though not in quality) and is widely distributed. The cattle have horns and weigh 1300 to 1500 lb. There are more animals of this breed in the United States than any other breed of dairy cattle. They are found in greatest numbers in the northern State. See Handbook, P. 263.

Holstein-Friesian Association of America—An association of the breeders of the Holstein-Friesian breed of dairy cattle. Their headquarters are at Brattleboro, Vermont.

Holstein Skim-milk Cheese—See Cheese.

Home Project—A piece of work conducted by a pupil in vocational agriculture on his own farm or some farm other than that owned and operated by the school or an organization. See Project, Agricultural.

Home-Trade Cheese—See Cheese.

Hominy, Hominy Chop, Hominy Meal—See Feeds and Feeding.

Homo Dee Milk, (Borden's)—Name used for their homogenized vitamin B Milk.

Homogenization - Homogenization, One-Stage - Homogenization, Two-Stage-Homogenization Efficiency Index - Homogenizer—See Milk, Processing and Processing Equipment.

Homogenize—To force a substance through a small opening under pressure.

To force milk or cream or ice cream mix through a homogenizer in order to make the product smoother textured and of uniform consistency throughout. This is done by breaking up the solids, especially the fat, into very much smaller units than their natural state.

Homogenized Milk—See Milk, Grades of.

Homologous—Similar. See Homozygous and Heterozygous.

Homotypic Division—Generally, the second or equational division of meiosis in which a longitudinal half of each chromosome is passed to each daughter cell, later to become gametes. See Meiosis.

Homozygous—A term used to describe a condition in which both genes of a pair are alike.

Hone—A stone of a fine grit used for sharpening cutting instruments.

Honey—A sweet viscid material made in the honey sac of bees from nectar of flowers and stored in the hive to serve as food for the larvae and, in the case of some bees, for food during the winter. It is composed principally of two sugars, fructose and dextrose. The color is from a gray white to a darkish yellow, largely depending on the food on which the bees feed. U.S.D.A. gives the following analysis: Invert Sugar 74.41%, Sucrose 1.98%, Dextrin 2.03%, Formic Acid 0.09%, Water 17.5% and undetermined 3.81%. Honey is used to some extent in ice cream making as a substitute for other sugars. However, on account of certain sugars, it does not combine well with certain fruit flavors.

Honeycomb—In animal anatomy, the second stomach of a cow. It is so called because in appearance the lining of this stomach resembles a honeycomb. See Reticulum.

Honey Cream—See Milk and Cream.

Honor Cow—A cow that has met the requirements for some honor in production or type or both, set by the Breed Association or some other organization interested in the improvement of dairying.

Honor Roll of Cows—A listing of the amount of butterfat produced by a cow in one month or in ten months or a year. Usually a cow must produce at least a specified number of pounds before she is entitled to be listed. The honor roll may be compiled from any group of tested cows by an individual, breed association, dairy herd improvement association, college or similar group.

Honor Roll of Herds—A listing of the average amount of butterfat produced by a herd in a specified length of time, usually a year. Usually a herd must average a specified number of pounds before it is entitled to be listed. Honor rolls may be set up by breed associations, dairy herd improvement associations, states, counties or similar groups.

Hoof—The curved covering of horn which protects the front of, or encloses the ends of the digits of, certain mammals.

Hoofs, Trimming—The proper shaping of the cow's hoofs. This can be done by carefully trimming the hoofs with a chisel, rasp and pincers.

Hoop Filler, Hooping the Curd—See Cheese.

Hop Cheese—See Cheese.

Hop Clover—See Feeds and Feeding.

Hopper System—See Ice Cream.

Horizon, (Soil)—A layer of soil with certain characteristics different from the layers above and below it.

Horizontal Curd Knife—See Cheese.

Hormodendrum Olivaceum—A causative organism of black discoloration and mustiness of blue cheese; a fungus.

Hormone—A chemical substance produced by any one of the endocrine (ductless) glands and usually secreted in minute quantities into the blood stream whereby it is carried to specific tissues in which it produces profound changes. Some of these changes produced by hormones affect growth, digestion, metabolism, milk secretion, the "let down" of milk, and the development of sex. The more important glands of internal secretions are the thyroid gland, the parathyroid gland, the pituitary body, the adrenal glands, the pancreas, and the sex glands.

Horn—One of the processes borne on the head of many mammals and used chiefly as weapons. Those on some animals, as cattle, sheep, and goats are unbranched and permanent on both sexes. On others, as the deer, they are branched, are called antlers, appear only on males, and are shed and renewed annually.

Horn Fly, (*Haematobia serrata*)—A fly introduced into this country in the latter part of the 19th century. It is much smaller than the common house fly, and gets its name from its habit of gathering about the base of horns in cattle. Its bite is as irritating as that of a mosquito bite. The eggs are laid in fresh manure and require about 10 days to develop into adult flies.

Horn Trainer—A special mechanical device often used to train the horns of young cattle to grow in the fashion or shape favored by the different breeds and breeders.

Horrall and Elliker Test—See Starter Activity Tests (Dairy Tests).

Horse Manure—The excrement of horses. Used as a source of heat in hotbeds and as a fertilizer for crops in general. The average composition is 0.55 - 0.3 - 0.4, nitrogen, phosphoric acid and potash, respectively.

Horsepower—The power which a horse exerts in pulling. A unit of power equal to 33,000 foot-pounds of work per minute. One horsepower is equivalent to 0.746 kilowatt.

Hortvet Cryoscope—See Dairy Tests.

Hospital Stalls—Box stalls in which sick cows can be kept isolated to prevent the spread of any contagious or infectious disease to the rest of the herd.

Host—Any living animal or plant affording subsistence or lodgment to a parasite.

Hot-blooded—Said to have blood derived from thoroughbred animals particularly in the case of horses, but also applied loosely to other purebred animals such as dairy cattle. Some characteristics are excitability, high spiritedness, etc.

This term, hot-blooded, is not correctly used but is in quite common usage.

Hot Iron Test—See Dairy Tests.

Hot Pack, Hot Pack Process of Cream Cheese—See Cheese.

Hot Water Test, (Cheese)—See Dairy Tests.

Hot Well—A steam jacketed kettle for forewarming milk in condenseries.

Hotis Test—See Dairy Tests.

Hoven—See Diseases in Cattle.

Hubam Clover—See Feeds and Feeding.

Hubl-Wijs Value—The amount of iodine or bromine, in grams, absorbed by 100 grams of unsaturated fatty acids. The value for butterfat is 26.0 - 33.0. It is also known as the Bromine or Iodine Value. See Iodine Number.

Huffed Cheese—See Cheese Defects. (Finish and Appearance).

Hulled Oats—See Feeds and Feeding.

Human Milk, Humanized Milk—See Milk and Cream.

See Dairy Tests for Determination of. (Polonowski and Martin Test).

Humic Acid—A term of varied usage but usually referring to a mixture of indefinite composition of dark colored organic substances precipitated upon acidification of a dilute alkali extract of soil. Used by some workers to designate only the alcohol-insoluble portion of this precipitate. In chemical literature may represent a preparation obtained by the treatment of sugars with mineral acids.

Humidity—Moisture; dampness; a moderate degree of wetness, which is perceptible to the eye or touch, esp. of the atmosphere, or of anything which has absorbed moisture from the atmosphere.

Humidity, Absolute—Mass of water vapor present in unit volume of the atmosphere, usually measured as grams per cubic meter. It may also be expressed in terms of the actual pressure of the water vapor present.

Humidity, Relative—The water content of a gaseous atmosphere at a given temperature expressed as a fraction or a percentage of the water content at saturation at the same temperature.

When air is fully saturated, or carrying all it can hold at a given temperature, its humidity is 100%.

Humus—A brown or black material formed by the decomposition of vegetable or animal matter. The well-decayed, complex, and fairly stable organic part of the soil. See Organic Matter.

Hungarian Millet, Hungarian Vetch—See Feeds and Feeding.

Husbandman and Husbandry—Terms generally applied to a farmer and his business, i.e., raising crops and livestock.

Husk—The outer covering of various seeds, especially when dry; the chaff of grain; the husks of corn.

Husking Glove—A strong glove with metal plates and hooks on the palm and palm side of the fingers, used in husking.

Hvid Gjedefost—White goat cheese. See Cheese.

Hybrid—In genetics, an individual resulting from the mating of individuals belonging to different genotypes, or different genetic make-up.

By many plant and animal breeders the term hybrid is limited to a cross between different species, cross-breeding or hybridism being used for a cross between races or varieties of the same species.

Hybridization, Hybridize—The process of bringing together parent plants or animals of different kinds or groups for the purpose of reproducing them and creating more.

To produce or to cause to produce hybrid offspring.

Hydrate—A compound formed by the union of water with some other substance and represented as actually containing water.

Hydrated Lime—The product resulting from reacting burned lime (Calcium Oxide) with water to form calcium hydroxide or slaked or hydrated lime. Reacts much faster in the soil than ground limestone to correct soil acidity. Also called Slaked Lime.

Hydraulic Cream Separator—See Milk Processing and Processing Equipment.

Hydraulic Ram—A machine for raising water by means of the energy of the moving water of which a portion is to be raised.

Hydrochloric Acid—HCl. An important strong acid widely used as a reagent.

Hydrogen Ion Concentration—The concentration of hydrogen ions (H⁺) in equivalents per liter. It is an expression of the reaction (acidity or alkalinity) of a solution. The greater the concentration of hydrogen ions the greater the acidity. Water has a concentration of H⁺ ions amounting to 1/10,000,000 equivalents per liter or 10⁻⁷ equivalents per liter. See pH.

Hydrogen Peroxide—One of the preservatives previously often used in milk. See "Budding".

Hydrogen Peroxide, (for cheesemaking)—See Cheese.

Hydrogenated Fat—A fat which has been treated with hydrogen with the mediation of a catalyst in order to saturate part or all of the unsaturated bonds. This treatment raises the melting point of the fat.

Hydrolysis—A chemical breakdown or dissociation of a compound by the action of water. Various agents such as acids, alkalis, and enzymes are often employed for this purpose. When this is brought about in vegetable or animal body through enzyme action it is known as "splitting" as fat, starch or sugar splitting. The decomposition of fats by the agency of superheated steam is also a type of hydrolysis.

Hydrolyzed Sawdust, Hydrolyzed Straw—See Feeds and Feeding.

Hydrometer—An instrument for measuring the densities or specific gravities of liquids. It consists of a long slender glass float weighted at the lower end and provided with a scale so graduated that the depth to which the instrument sinks in the liquid indicates the specific gravity by direct reading on the scale.

Hydrophile—A substance exhibiting a marked affinity for water. The term hydrophilic is also descriptive of such a substance. In relation to colloid systems the term has the same general significance as emulsoid. See Lyophile.

Hydrophobe—A substance having only slight affinity for water. In relation to colloid systems the term has the same significance as suspensoid. See Lyophobe.

Hydroxyproline—An amino acid found in the protein of milk to the extent of 22%.

Hygienic Construction of Dairies—Hygienic construction is probably more important than hygienic methods since it encourages hygienic practices especially at an economical cost. The essential factors in hygienic construction are very similar for utensils, equipment, work rooms, buildings and surroundings. They may be listed as:

1. Surfaces should be smooth and free from scratches and grooves. This is particularly essential for surfaces coming in contact with the product such as the inside of utensils and equipment. Floors of work rooms are the only exception and these should be slightly rough (like the commonly known "wood finish" on concrete) to prevent accidents by slipping on the wet floor.

2. Surfaces should be sloping and free from depressions that do not drain quickly and completely. This is desirable not only in equipment but also for all floors, window sills, ledges, shelves, etc.

3. Corners should be rounded and large enough to permit scrubbing with a brush. Sharp corners and crevices must be avoided in surfaces which come in contact with dairy products. In walls, floors, the outer surface of equipment, etc., sharp corners and crevices are objectionable because they are difficult to get completely clean.

4. All surfaces should be easily accessible for scrubbing. Pipe fittings should be tee, never elbows, and easily dismantled to permit visual inspection for cleanliness. Coils in vats should not interfere with scrubbing the entire surface of the coil and the vat. Equipment should be mounted on the floor so as to permit scrubbing the floor instead

of leaving corners and floor space under the equipment that cannot be scrubbed daily.

5. Materials used in construction should be impervious to moisture and free from objectionable odors. Certain woods and paints have odors that are easily absorbed by dairy products. Some metals tend to dissolve in the product and to cause undesirable flavors which are frequently described as "cardboard", "tallowy" or "metallic". This injurious effect can be avoided by covering the metal with a film or coating of tin. When such tinned equipment is used it should be frequently inspected for small spots where the tin coating has been removed by scratching or wear. Most modern equipment is made from stainless steel which has no injurious effect on the flavor of dairy products.

6. Light is essential for proper cleaning. It should be available especially during cleaning operations without interfering with the operation (i.e., the operator should not have to stand in the light and cast a shadow on the surface being scrubbed).

7. Ventilation with fresh, clean air is essential. All equipment, utensils, and all rooms, cupboards, etc., should be constructed to permit thorough ventilation without contamination. This is not only important to avoid undesirable odors but to reduce the objectionable moisture in the atmosphere.

8. Rodents and insects should have no place to collect or hide. Dark places, moist places, and unclean places, attract rodents, ants, roaches, flies, etc. Removal of all such places eliminates the pests. Sprays, poisons, screens, and traps should be used only as a temporary measure, preferably not at all. Neither the pest nor the usual "control measures" belong in a respectable dairy, and either one is evidence of careless methods.

9. Segregation of operations is necessary in the construction of buildings. There should be separate rooms for unpasteurized or raw products to avoid contamination of equipment and possible mixing of unpasteurized with pasteurized products; for products with pronounced odors that may be easily absorbed by other products; for wash rooms, for cans, bottles, etc.; for boilers, engines, refrigeration compressors, etc.; for all storage rooms whether refrigerated or not; and for rest rooms (toilets) and locker rooms.

10. Special facilities are necessary in the construction of buildings and work rooms. Conveniently located facilities for obtaining an ample supply of both hot and cold

water are most essential. The supply of both hot and cold water should be unrestricted if cleanliness is expected. Mixing outlets, permitting adjustment of temperature, should be located for convenience in applying an ample supply of water to all parts of every room. Floor drains in each room are essential. They should be located so as to drain the floor completely and not leave even shallow puddles. When possible it is desirable to locate them at the sides or at least out of the traffic lanes, but they must be easily accessible for cleaning when they become clogged; for this reason they are often located in the center of the room. A most important special feature of each room is a lavatory, i.e., a small basin for washing hands. This lavatory should be equipped with a mixing faucet for hot and cold water, soap or cleaning agents, a cold water drinking fountain, and single service (paper) towels. Thus personal cleanliness is encouraged, and the improper use of equipment (such as sinks for washing utensils, drinking from a hose, contamination by handling equipment with dirty hands) is avoided.

Hygienic Personnel—Hygienic personnel is probably the most important factor not only in obtaining but also in maintaining healthful quality in the product. Every person associated with dairy products should be hygienic-minded and constantly observant of sanitary details. This applies to such persons as mechanics, electricians, janitors, stenographers, truck drivers, etc., as well as to persons actually operating equipment for processing the dairy product. The three characteristics of hygienic personnel may be listed as follows:

1. Hygienic conscience, or a subconscious desire to employ only healthful practices and habits as well as a determined conscious effort to correct errors in hygienic behavior.

2. Physical health, especially freedom from contagious diseases. Medical examination for contagious diseases (particularly typhoid which supports "carriers") should be required once a year. Rigid isolation should be practiced even in the event of less fatal contagious diseases such as common colds.

3. Hygienic habits including innumerable personal details such as the following:

- a. Hands and nails should be clean. The hands should be washed before touching dairy products or clean utensils; especially after touching unsterile cans, shaking hands with anyone, coughing

- against the hand wiping the nose scratching visits to the toilet etc.
- b Insanitary practices such as coughing in or near the equipment spitting on the floor etc., should be avoided
 - c A net or cap should be worn to prevent loose hair from contaminating the product or equipment.
 - d Clothes should not be worn longer than one full day between launderings and should be changed oftener when they become untidy. Clothes worn on the street or outside of the work room should not be worn while handling the product. Footwear used while cleaning larger vats that must be entered should not be worn elsewhere even on the floor of that room.
 - e Wounds or sores should be bandaged to prevent any possible contact by soaking through the bandage. When this cannot be avoided the person should not touch the equipment or product.

In addition to the above and as an added protection all employees coming in direct contact with food milk or other dairy products should be examined regularly by a nurse foreman or some other competent person for evidence of contagious diseases. By means of education and intelligent application many causes of potential or actual disease may be found in this way. Only persons who are inherently clean should be employed in the food or dairy industry. All new employees should be watched carefully until they have been so classified.

Hygienic Suggestions for Dairymen—Careful health checks of all employees by medical or health inspectors. Strict observance of possible ways of communicating disease. Hands should always be washed after using the toilet care in the use and handling of any product that may cause food poisoning. Observe all regulations that have to do with clean milk production.

Hygrometer—An instrument for determining the humidity which is of especial importance in checking cold storage and cheese curing rooms.

Hygroscopic—The property of absorbing moisture from the air. Milk powder is highly hygroscopic.

Hygroscopic Coefficient—The maximum amount of soil water retained in a soil in contact with a saturated atmosphere and in the absence of any other source of water.

Hygroscopic Water—The water held with such great tenacity by soil particles that it is unavailable to plants.

Hypochlorites—(Usually sodium hypochlorite) are sometimes added as constituents in washing powder because of their germicidal action. They are rapid in action lose strength easily but are rather corrosive on equipment.

Sanitizing solution should contain not less than 50 parts of available chlorine per million parts of solution. The solution should be in contact with the surface for at least 15 seconds. Sodium hypochlorite is prepared by the electrical decomposition of salt in a slightly alkaline solution and many preparations are available under trade names. It may also be prepared in a stone crock as follows: To 4 lb of "chloride of lime" add 5 gallons of water and to this add 1½ lb of washing soda. Thoroughly mix with a wooden paddle and allow to stand until the lime settles to the bottom. Then drain off the clear solution into a bottle. Use one half pint of this solution to 2 gallons of water for a sanitizing solution.

Hypostatic—As applied to genetics that condition in which a factor is prevented from exhibiting its normal effect in the development of the individual due to the presence of some factor other than its allelomorph. Contrasted with epistatic.

Hysteresis—A single term expressing the influence of the previous history of a colloid system on its present behavior. This is especially true of lyophilic gels such as gelatin.

In cheese-making it has been found that when milk is heated for 30 minutes at 104-141°F and rapidly cooled to 81°F, the first effect is increased coagulability but the milk gradually loses coagulability as the interval between heating and addition of rennet lengthens.

I

Ice Bank Tank—A term used to describe one type of bulk tank refrigerating unit in which an additional tank of water is

chilled down to low temperatures and used as an additional reserve in the milk cooling process.

ICE CREAM

A frozen product made largely from milk, cream, condensed milk, milk powder, sweet butter, or any combination of such products, sweetened, flavored, and usually having a small percentage of gelatin or other stabilizer to improve the texture. Eggs are frequently used, either in fresh, frozen, or powdered form. The approximate range in composition of plain ice cream is as follows: Fat, 8-22%; Serum Solids, 6-12%; Sugar, 12-18%; Stabilizer, 0-7%.

Aging the Ice Cream Mix—Aging the mix (allowing it to stand for a period of time) before freezing, has been practiced since the inception of the ice cream industry. The changes which undoubtedly occur during aging are: 1. The fat is solidified. 2. The gelatin swells and combines with water. 3. The proteins of the mix may change slightly. 4. The viscosity of the product is increased, largely due to the previously mentioned changes. 5. The various flavors in the mix permeate and blend to give the desired flavor in the finished product.

Balanced Ice Cream Mix—One in which the proportions of the constituents and ingredients will produce a fine and satisfactory ice cream. See Ice Cream Books on How to Calculate Balanced Mix.

Balanced Method—A method for calculating ice cream mixes. The term originated in connection with the work reported in U.S.D.A. Bul. 1123. The proportions obtained by this method are based on 5 conditions: 1. The amount (pounds) of mix that will be necessary to produce the number of gallons of ice cream desired. 2. The composition (standard) of ice cream desired. 3. The amount of solid constituents necessary for the mix. 4. The quantity and physical condition of the ingredients on hand. 5. The composition of the ingredients to be used.

Base Ice Mix, Flavor and Color Mixture for—The following ingredients combine to make the flavor and color mixture: 1. Fruit juices: Although the amount varies with the intensity of the flavor, it should be from 15 to 20% of the weight of the finished ice. 2. Flavoring: Natural extracts and artificial flavors may not produce as desirable a flavor as the fruit juices, but they are often used to fortify the flavor and thereby produce a more uniform product. 3. Coloring: Approved artificial food coloring aids in maintaining a uniform shade of color characteristic for and suggestive of flavor. 4. Citric acid solution: To obtain the de-

sired tart flavor a fruit acid such as citric acid or tartaric acid may be added. When fruit acids are not available, either saccharic acid, phosphoric acid, or lactic acid may be used, but these do not impart an equally desirable flavor. It is a common practice to use a 50% solution (i.e., one lb. of crystals to one lb. of water) of either citric acid or tartaric acid. The amount of this solution generally used varies from 4 oz. to 10 oz., depending on the acidity of the fruit juice. The titratable acidity of the finished ice should not be less than 0.35% nor more than 0.40% when expressed as lactic acid. 5. Additional water may be necessary to make the total weight of this mixture up to 20 lb.

Base Ice Mix, Preparation of—This base is prepared by slowly adding the dry ingredients to at least part of the water, using care to avoid lumpiness. Heating may be necessary to facilitate solution, especially when stabilizers like gelatin or agar-agar are used. Pasteurization is optional, but homogenization is not practiced. The prepared base is cooled before other ingredients are added. Aging is necessary only when gelatin or agar-agar is used in the stabilizer, and then an aging period of 12 to 24 hours is desirable. To each 80 lb. of the cooled base mix enough flavor, color and water are now added to make the total weight 100 lb.

Base or Stock Ice Mix—Ices are frequently made in hundred pound lots and manufacturers prepare a "base" or "stock" mix as follows: 21 to 25 lb. sucrose (cane or beet sugar); 7 to 9 lb. glucose, invert sugar, or corn sugar; 0.4 to 0.6 lb. stabilizer; water to make a total weight of 80 lb. of base or stock mix—balance of the 100 lb. being flavoring and additional water. The amount of sucrose used should be the least that will give the desired sweetness in the finished ice, thus giving a higher melting point more suitable for dipping at the usual cabinet temperatures of 3° to 8°F. The amount of glucose, invert sugar, or corn sugar should be about one-third of the amount of sucrose. This sugar reduces the tendency to form a surface crust which sometimes happens when sucrose is used alone. The use of corn syrup solids tends to keep the melting point nearer to that of ice cream, so that the product will have a firmness most suitable for dipping at the usual cabinet temperature.

Stabilizers are more important in ices than in ice cream because of the lower total solids content. Of the various stabilizers—

cellulose gum, gum tragacanth, India gum, agar-agar, gelatin and pectin—the last two are most widely used. Best results are obtained by using a combination of two or more of these stabilizers, the ratio of combination depending on the grade and kind of stabilizers being combined. Enough stabilizer should be used to cause a partial gelling at cold room temperatures.

Body—Body may be said to be that quality which gives weight and substance to the product and enables it to stand up well. Thus it refers to consistency (chewiness) or firmness and to the melting character of ice cream. The ideal body is that which is produced by the correct proportion of milk solids (both butterfat and serum solids) together with the proper overrun and which melts fairly rapidly at room temperature to a smooth liquid similar in appearance and consistency to sweet cream containing about 40% fat. It results from the proper combination of composition and method of processing.

Bulk Ice Cream—Ice cream merchandised in cans ranging in capacity from one-half to five gallons.

Calculating Cost of Ice Cream Mixes—See *Ice Cream and Other Frozen Desserts* by Frandsen & Nelson or other Ice Cream texts.

Calculations, Importance of—Since the palatability, quality, body and texture, and cost of the ice cream hinges upon the ice cream maker's ability to select and use, in the right proportion, the various ingredients from those that are available, it becomes highly desirable for him to learn to calculate accurately the amount of each ingredient that goes into the mix that he desires to make. In other words the ice cream maker needs to know the answer to such questions as: How much does it cost to make a gallon of ice cream? How much ice cream can be made from a gallon of mix? How much cream, sugar, etc., are needed to make 100 lb (or any other number of lb) of mix? Answers to such questions can be obtained only if he has the "know how" to make at least simple, although time-consuming calculations.

A knowledge of calculations is also helpful in properly balancing a mix, and especially in establishing and maintaining uniform quality, and in producing ice cream that conforms to the necessary legal standards. Some authorities think that the ice cream maker's knowledge concerning the making of ice cream is in direct proportion

to his ability to make the necessary calculations.

See *Ice Creams and Other Frozen Desserts* by Frandsen & Nelson or other Ice Cream texts for Methods of Calculation.

Certified Ice Cream—Ice cream manufactured from certified dairy products, and under conditions approved by a milk commission, requirements somewhat similar to those for certified milk.

Chocolate Syrup, Preparation—The small ice cream manufacturer usually prefers to flavor chocolate ice cream by adding syrup at the freezer. The syrup should be made up in a chocolate kettle or double boiler. Mix the sugar and cocoa or chocolate together and add enough water to make a heavy paste. Heat gradually and add water slowly as necessary. (The final syrup should contain enough water so that it will pour when cooled.) The syrup should be heated to the boiling point and cooled before using so as not to prolong the freezing operation.

Classification of Ice Cream, Sherbets & Ices—Following is a list of the suggested classes of ice cream: 1 Plain, 2 Bisque, 3 Candy or Confection, 4 Chocolate, 5 Fruit, 6 Nut, 7 Puddings, 8 Custard, 9 Parfait, 10 Mousse, 11 Rippled, 12 Rainbow ice cream, 13 Gelatin cube, 14 Ice Milk, 15 Ices, 16 Frappe, 17 Punch, 18 Granite, 19 Sherbet, 20 Souffle, 21 Lacto, 22 Fruit Salad, 23 Fancy Molded Ice Cream and 24 Novelties.

C.M.C.—The trade name for sodium carboxymethyl cellulose forms the basis of some stabilizers which are now being accepted by the ice cream industry. It has high waterholding capacity and is easily dissolved in the mix—two qualities of a fine stabilizer—and it acts also as an emulsifier. The amount to use is slightly less than that of gelatin. It does not form as firm a gel as gelatin and some of the vegetable stabilizers, but seems to have merit for use in ice cream and especially in sherbets and ices.

Cocoa, Concentration of Flavor of—Cocoa is more concentrated for ice cream flavoring than chocolate liquor because it contains a higher percentage of the real chocolate flavor. The fat which has been removed is nearly tasteless and adds very little flavor to the ice cream mix. This is shown in the following equation: 100 lb of cocoa contains 78 lb flavor plus 22 lb fat, 100 lb

chocolate liquor contains 48 lb. flavor plus 52 lb. fat.

It is evident, therefore, that in 100 lb. of cocoa there is approximately 30 lb. more of real chocolate flavor than in 100 lb. of chocolate liquor.

Cocoa or Chocolate Liquor, Amount to Use in Ice Cream—The amount of cocoa or chocolate liquor to use in ice cream depends upon several factors, such as consumer preference, color desired in ice cream, strength of flavor, fat content of flavor, etc. The usual recommendation is 4 lb. of cocoa or 6 lb. of chocolate liquor to 100 lb. of mix. Extra sugar should be added to compensate for the bitter flavor of the cocoa, the usual recommendation being the same weight of sugar as of cocoa or chocolate. The tendency seems to be to flavor chocolate ice cream too highly.

Color in Ice Cream—Ice cream should have a delicate, attractive color which suggests or is readily associated with the flavor. Only colors certified by the Food and Drug Administration of the United States Department of Agriculture should be used. Almost all flavors of ice cream should be slightly colored. Enough yellow color is generally added to vanilla ice cream to give it the shade of natural cream produced in the summer months. Fruit ice creams need to be colored because about 15% of fruit, the maximum commonly used, produces only a slight effect on color. Chocolate ice cream is one of the exceptions. It rarely needs to be colored, for the required amount of a Dutch processed cocoa will produce sufficient color.

Most colors are of chemical origin. A weak alkaline solution annatto color is about the only vegetable color used in ice cream. However, this does not produce a good egg-shade yellow, but rather a pinkish tinge. Therefore, the bulk of colors used are chemical in origin. Most ice cream makers purchase the desired colors in liquid or paste form.

Complex Ice Cream Mixes—Complex mixes include all mixes except those classed as simple mixes. They can usually be identified by the fact that at least one constituent is obtained from two or more ingredients, as in a mix in which the serum solids are obtained from cream, milk, and plain condensed skim milk.

Composition (Approx.) and Weights Per Gallon of Ingredients used in Ice Cream Mix—See Table in Reference section, P. 293.

Corn Syrup—This product contains no sucrose but does contain a variable amount of dextrose and maltose. It is considered a good source of dextrose. Ice cream makers generally estimate that 1.5 lb. of corn syrup will replace 1 lb. of sucrose.

Corn Syrup Solids—A dry form of regular corn syrup prepared by acid hydrolysis of cornstarch. It is a white powder of the following approximate composition: Moisture, 3.5%; Dextrose Equivalent, 42.5%. Carbohydrate solids composition: Dextrose, 21.0%; Maltose, 35.0%; Dextrins, 44.0%.

In ice cream manufacture, this type of sugar is used to replace some of the sucrose, to impart definite qualities to the body and texture of the finished product. Known also as "Tro-dex" and "Dri-Sweet".

Dahlberg Test—Sometimes called the test-tube test, the Dahlberg test serves as a guide in determining the amount of gelatin needed in the mix, and comparing the stabilizing ability of different gelatins when used in ice cream.

See description in *Ice Creams and Other Frozen Desserts* by Fraudsen & Nelson.

DEFECTS

Acid Flavor—A defect of ice cream often caused by the use of sour milk or sour milk products.

Bleeding—A trade term used to denote the settling out of the unfrozen portion of the sugar from sherbets and ices.

Buttery Texture—A defect of ice cream characterized by the presence of lumps of butterfat in the ice cream so large that they are noticeable to the taste. It is caused by churning during the freezing process. Proper homogenization prevents this defect. With unhomogenized or improperly homogenized mixes, the mix should be put in the freezer at a temperature well below that at which churning takes place readily.

Coarse Texture—A texture defect of ice cream characterized by the presence of large ice crystals which form during a slow freezing or hardening process. Large ice crystals are favored by insufficient stabilizer, slow freezing in the freezer, slow freezing in the hardening room and insufficient hydration of the protein. Incorporation of air as small air cells, increase of any of the total solids, homogenizing, and aging all tend to overcome this defect and produce a smooth texture. The mix should be frozen in thin layers by the freezer and also be frozen as stiff as possible in the freezer so that a

minimum of water remains to be frozen in the hardening room where since the ice cream is frozen without agitation large ice crystals may form. Partial melting should be avoided as this results in separation of free water which forms ice crystals when the ice cream is refrozen. Because of similar reasons supercooling and temperature fluctuations in the hardened ice cream should be avoided.

Condensed Milk Flavor—One of a group of flavor defects in ice cream characterized by a cooked milk taste. Others in the group are cooked and dried milk flavor defects. The name is derived from the fact that condensed milk has a characteristic cooked flavor caused by its subjection to high temperatures of forewarming and sterilization. A cooked flavor plus a serum solids content higher than normal is the cause of the defect.

"Crumbly" Body—Lacks cohesion and pulls or breaks apart very easily. A common defect of sherbets and ices where it is less serious than in ice cream. It is frequently associated with a low solids content insufficient stabilization, excessive overrun, low homogenization pressure, large air cells and imperfect homogenization. It is similar to the defect sometimes referred to as "dry" body which results from excessive use of emulsifiers, egg yolk solids, certain types of vegetable stabilizers or the addition of dry milk solids at the freezer.

Curdled Appearance on Melting—A defect occurring in melted ice cream. The surface of the liquid is dull and finely wrinkled as if there were a scum on the surface or when separation may actually appear. Enzymatic ice cream improvers used in excessive amounts or over excessive periods of time may cause this defect. Other causes are not fully understood at present.

Dead Whip—A condition in ice cream which is caused by the incorporation of too much air making the ice cream very fluffy and lacking in firmness. This may occur as a result of prolonged whipping at too high a temperature and is favored to the greatest extent by mixer of high viscosity. The exact physical conditions which cause various mixes to whip dead are not known.

Egg Flavor—A flavor defect of ice cream characterized by a raw egg yolk taste. This flavor is the result of incorporation into the mix of uncooked fresh frozen, or powdered egg yolk.

Egg Powder Flavor—An ice cream flavor defect resembling the cooked or custard flavor defects. However, it is more persistent and the aftertaste lingers for some time.

Elastic Body—See Pasty body.

Flaky Texture, (Snowy Texture)—A defect of ice cream involving the incorporation of a large amount of air as large air cells. When the air cell walls are frozen, they are films of microscopic size, and when the structure is disturbed as in dishing the ice cream these films present a flaky appearance. Contributing factors may be lowness of total solids or gelatin, freezing the mix too soft in the freezer, inefficiency of whipping due to faulty freezer design, slow running of the freezer, or low whipping ability.

Fluffy Texture—A defect of ice cream characterized by a crumbly texture. Such ice cream upon melting yields a proportionately small amount of liquid. There are large air holes present and an open texture throughout. It compresses badly on dipping. A fluffy ice cream usually melts slowly in the dish leaving a foamy, sponge-like structure.

Foamy Body—Foamy appearance of melted ice cream. This defect is likely to be caused by gelatin used in excess, a heavy mix consistency, and eggs. Egg solids are especially likely to cause it.

Fruity Flavor—An off flavor due to the action of certain bacteria which have been allowed to grow in the mix.

Gelatin Flavor—An ice cream defect caused by the addition to the mix of too much gelatin or gelatin of inferior quality.

Gelatin Lumps—A defect of ice cream in which lumps of gelatin appear in the finished product. It is caused by stirring the hot gelatin into the cold mix. The mix must be strained before freezing to get rid of these lumps. The lumps can be avoided entirely either by mixing the gelatin with water or by sprinkling it over the mix during pasteurization.

Gummy Body—See Pasty Body.

Gummy Texture—A texture defect of ice cream. A gummy textured ice cream seems to hang together like so much putty. When the ice cream is dipped, there is a tendency for it to curl up behind the dipper, leaving coarse broken irregular waves. Gummy ice cream often fails to melt down at ordinary temperatures.

Harsh Flavor—These flavors are sharp and lingering, such as ginger, and vinegar. A good illustration of this defect in ice cream is obtained when quite large quantities of lemon or orange extract are used, giving a flavor entirely due to the lemon or orange oil. Harsh flavors are usually due to the use of inferior flavoring substances, but may in some cases result from the use of too much flavoring extract. Inferior and artificial extracts lack the fine, delicate qualities of the high grade extracts and frequently give a very pronounced but not pleasing flavor to the ice cream.

Heat Shock—When ice cream is allowed to warm up (heat shock), and is refrozen it will have a coarse texture due to this so-called heat shock.

Heavy Body—See Soggy Body.

High Flavor—A flavor defect of ice cream resulting from the use of too much flavoring material. In some cases an excess of flavoring material will impart a sharp or bitter flavor to the ice cream. A poor quality of flavoring may have the same effect.

High Melting Resistance—See Pasty Body.

Icy Pellets—A defect of ice cream sold by retailers in bulk. It is caused by the dropping of water from the dishing spoon onto the surface of the ice cream.

Icy Texture—A common texture defect in dipped ice cream. It is manifest during dipping by the feel of the dipper as it strikes or breaks the tiny icicles which have formed. Ice crystals can be felt easily between the teeth or with the tongue. As the ice cream melts in the mouth, the ice particles are temporarily left behind. They register a greater sensation of cold, and as they melt the flatness of the flavor is apparent. It is caused by using damp cans to fill into at the freezer and using wet dippers in dipping the ice cream.

Low Flavor—This refers to an insufficient amount of flavoring material; that is, not enough to make the flavor easily recognized. It may be due to insufficient or weak flavoring material, to some other substance obscuring the flavor, or to the ice cream mix being cooked after the volatile flavoring material is added.

Low Melting Resistance—See Weak Body.

Moldy Nut Flavor—Due to use of old, moldy nuts or nut products.

Non-Typical Flavor—An ice cream defect in which the flavor is not typical of what it should represent. It includes synthetic flavors that are not true imitations. Sometimes a pronounced coumarin flavor from artificial vanilla compounds or tonka bean extract is present in vanilla ice cream, or caramel used for coloring may obscure the flavor of maple ice cream.

Off-Flavors in Ice Cream—Off-flavors due to bacterial action may cause fermentation of the mix or the products from which the mix is made which in turn produces fruity, cheesy, musty, unclean, putrid and sour flavors. The most common off-flavor is sour.

Old Cream Flavor—A common defect of ice cream brought about by the use of cream or butter of poor quality. This defect may later develop into more serious off-flavors.

Old Ingredient Flavor—An ingredient flavor defect of ice cream. The presence of this defect is noted toward the last of the tasting period and persists to the end. It fails to clean up.

Pasty Body—A defect of ice cream which causes it to dish as a doughy or pasty mass. The main cause of this defect is too high a gelatin or gum content.

Poorly Blended Flavors—A defect of ice cream in which certain flavors, though they may be individually pleasing, are unpleasant when combined.

Rubbery Texture—A self-descriptive name for an ice cream defect caused by an excessive proportion of gelatin or gum.

Salty Flavor—This flavor may be due to the use of too much table salt in the mix, but more commonly is caused by the leakage of brine used in packing the ice cream.

Sandiness—A texture defect in ice cream caused by the presence of alpha lactose crystals in the ice cream. These crystals are hard and produce a gritty sensation to the mouth as though sand were present. Some factors causing crystallization of lactose are:

1. High serum solids content of mix.
2. Temperature fluctuations in freezing and storing.
3. Presence of nuclei of lactose crystals.
4. Prolonged beating in freezer at low temperature.
5. Nut meats in ice cream.
6. Packaging of ice cream from bulk into small containers.

Snowy Texture—See Flaky Texture.

Soggy Body—A texture defect in ice cream due to the lack of proper whipping or air incorporation. The ice cream is too heavy and this soggy texture contributes to high melting resistance. It is also due to a low over-run, a high concentration of sugars that lower the freezing point or excessive concentration of gelatin.

Stale Flavor (Old or Rancid)—In ice cream a lack of freshness resulting from the use of stale ingredients or a slow turn-over of the ice cream particularly during the winter months.

Sticky Texture—A texture defect of ice cream characterized by the product's sticking to the spoon rather than dipping clean. Stickiness usually results from the use of too much stabilizer or sugar. Sticky ice cream is generally very resistant to melting at room temperature.

Too Soft Texture—Due to improper packing after freezing.

Uneven Color—An unusual and not very serious defect of ice cream in which the color is not evenly distributed throughout the mix. Prevention consists of adding the color to the mix before freezing and allowing enough time for the color to become thoroughly dispersed through the liquid. If the defect is caused by not adding uniform amounts of color, it results in producing a different color for each run.

Unnatural Color—A defect due to insufficient (pale) or excess (intense) color and colors that are not characteristic (true in shade) of the flavor. Examples of defective shades are the tannish brown of caramel instead of the reddish brown of chocolate or egg yellow for annatto color in vanilla ice cream or a dull grayish appearance (due to neutralization of the mix) in vanilla ice cream and a slight bluish tint (due to lack of acidity) in cranberry ice cream.

Weak Body—A defect due to a low total solids content combined with insufficient stabilization and therefore a thin mix—a mix which lacks consistency. It lacks firmness or "chewiness" and is invariably accompanied by rapid melting.

Denominator Multiple Counter—A series of counters mounted on a rack which are used to count the number of ice cream packages whose weights fall within the range indicated on each counter. For statistical weight control application.

Dextrose, Cerelease, Dextrose Hydrate and Corn Sugar—Trade names commonly applied to the most refined sugars obtained by hydrolysis of corn starch. Their sweetness is due to dextrose, i.e., d-glucose. Dextrose is now extensively used in ice cream and is particularly necessary for sherbets and ices where it seems to inhibit the crystallization of sucrose on the surface.

Digestibility of Ice Cream—Because the fat and the milk in most ice cream have been homogenized, ice cream appears to be more digestible than unhomogenized products. Ice cream is very palatable which stimulates the flow of the digestive juices, a valuable aid to digestive processes. These factors plus its smooth velvety texture tend to make it an ideal food for many invalids suffering from throat or stomach ailments. Hospital dietitians generally speak of it as a good morale builder.

Dry Ice Cream Mix—Ice cream mix all ingredients of which have been dried and combined so that only the addition of water and freezing are required to make the ice cream.

It was originally dried for easy shipment to the armed forces in all parts of the world. Several brands are on the market.

Egg Yolk Solids (Dried)—These solids are high in food value and when not too expensive are used by ice cream makers because they impart a desired delicate flavor and cause a desirable blending with other flavors. Their use also tends to improve the body and texture of the ice cream. Egg Yolk Powder if strictly fresh is somewhat cheaper and accomplishes much the same purpose.

Emulsifiers (Mixture of mono- and diglycerides)—Substances that collect on the surface of fat globules and the surface of the air cells. They seem to favor the development of small air cells and make them more uniform in size. They slightly improve the whipping ability of the mix and the texture of the ice cream. Like egg yolk solids they exert some stabilizing effect so that less stabilizer is required.

Enzymatic Improvers—A class of ice cream improvers which depend upon the presence of a coagulating enzyme that is capable of coagulating the casein in the ice cream mix. The enzymes used may be rennin, pepsin or possibly a protein coagulating enzyme from vegetable sources. In the past such improvers have been used to shorten the aging period of ice cream. There are now

ever, certain disadvantages in using them and their merits are very questionable. They cause shrinkage of ice cream in cans during storage; they may cause the melted ice cream to whey off and be curdy, and they are too expensive. If they are used, their action must be controlled so as to prevent too much coagulation of the casein and consequent curdling.

FANCY MOLDED, NOVELTIES AND SPECIALS

Very early in the history of the ice cream industry the small manufacturer with imagination often emphasized the possibilities and profits to be gained in making Fancy Ice Creams and Novelties. Recent advances in equipment for making, filling and decorating indicate the possibility of mass production at lower cost.

Ice Cream belonging to the class known as Fancy Molded Ice Cream differs from plain bulk ice cream chiefly in the form in which it is marketed. In some cases there may be a slight difference in the formula but the principal difference is in the manner of coloring, and in the size and form of packaging.

Difference in formula consists usually of the addition of a little more stabilizer or a little more milk solids in order to obtain a firmer body.

The difference in package is one of the distinguishing features of fancy ice cream. The most common package or form is the quart brick, easy to cut and serve. The individual cup mold (enough to serve one person) is also popular. However, much ice cream is molded in the form of animals, statues, flowers, fruits or other objects. The mold may be of individual size or it may contain a number of quarts of ice cream.

Color and Flavor Combinations—Most of the fancy ice creams are composed of two or more flavors and colors of ice cream combined in such a manner that each serving will consist of proportionate amounts of each. For example, the rainbow or variegated effects produced by carefully marbling or veining several colors of creams as they are drawn from the freezer into the molds or packages; or the afloats, produced by combining a pectinized fruit, in either layered or rippled design, with a plain ice cream; or ice cream combined with sherbets or ices in alternate layers. Ice Cream may also be used in combination with bakery products as in the cake rolls, and it may be coated with chocolate or other frostings,

as in the well-known chocolate bar. Each or all of this great variety of shapes and forms range from the well-known two or three-layer brick to the most intricate flower or geometric designs. These fancy molds or shapes are frequently used in carry-out packages, as individual servings of two ounces or more, or in packages up to two or three quarts.

Color and Flavor, Harmony in—This is of great importance in bulk as well as in fancy ice cream. Colors and flavors should therefore be selected with great care. The color must suggest the flavor and must harmonize with it. For example, a vanilla ice cream is yellowish (creamy in color), but a strawberry ice cream is pink because that is the color imparted to the cream by the natural fresh strawberry fruit. Fruits often do not color the mix sufficiently so it is customary to add enough coloring to remind one of the natural color of the fruit. Coloring does not add or detract from the flavor but unless the two harmonize there is nothing suggestive in the color. Light and dainty tints are the most pleasing to the eye, so color should be used sparingly.

Decorating Tools—In the past much of the decorating of fancy ice creams was done by hand and by the use of various forms and screens. Now, in general commercial practice, the decorating tool is a cone-shaped bag made of parchment paper, into the tip of which is inserted the metal points or nozzles through which the cream is extruded and laid down on the cake surface. These points or nozzles which come in various shapes such as cord, ribbon, leaf, rose, star, can be secured from dairy supply houses.

Fancy Centers with the Continuous Freezer—The extra stiffness of continuous freezer frozen ice cream opens up many new possibilities as to both speed and economy. These continuous freezers fitted with special shaped discharge tubes now make it possible to deliver the ice cream in layers of one, two, or three colors in brick molds. It also makes it possible to put fancy centers in many different types of packages. To deliver three different colors simultaneously three freezers must of course be hooked up and operated as one battery, delivering the different colored ice cream in the exact proportions wanted in each layer. To get good sharp outlines it is best to have the ice cream flowing through the center stiff enough to retain clear-cut form and outline. Freezer manufacturers will gladly furnish full information and details as to the

many specially designed tubes available. Among the more popular designs for center brick molds are: Lodge club and class emblems, class numerals, spade heart diamond and clubs, Washington and Lincoln busts, Santa Claus, turkey, hatchet, cherries, rose, hilly etc.

Ice Cream Names

Alaska & Design, (Two lur-clad figures)—A registered trade mark of the Joe Lowe Corporation for a chocolate coated frozen confection on a stick consisting of either (1) ice cream (2) ice milk or (3) vegetable fat frozen dessert.

Aufait Ice Cream—usually consists of a layer of fruit between two layers of ice cream. It can be modified by using fruit flavored gelatin instead of the usual layer of fruit preserves, jams or candied fruit. The fruit flavored gelatin has the advantage of being less sweet than the fruit layer which is ordinarily used. This fruit flavored gelatin should be slightly less firm than the gelatin cubes and is cut in slabs to form layers in the mold. These slabs are alternated in the mold with layers of ice cream.

"Babe Ruth"—The registered trade name of a product similar to chocolate covered ice cream bars except that it is in the form of a base ball and is poured into molds instead of being cut out of bricks.

Baked Alaska—Ice cream in pie or cake form which has been decorated with meringue and browned by placing momentarily in a hot oven.

Big Top Bar—Chocolate coated ice cream on a stick.

Bingo—A registered trade mark of the Joe Lowe Corporation for a chocolate coated ice cream frozen confection on a stick.

Bi-sicle—A registered trade mark of the Joe Lowe Corporation for (1) a quiescently and (2) an agitated frozen confection having two sticks and consisting of flavoring, sugar stabilizer, milk solids and water. See Fudge side 4 ounces containing butterfat.

Busque Ice Cream—Generally made from the regular mix but containing a bread product or confection such as macaroons, marshmallows or sponge with the addition usually of other flavoring material.

Bisquit Tortoni—A Neapolitan ice cream to which is added when partly frozen heavy or medium sweet cream. A further modification of this specialty is the addition of meringue and macaroons just before drawing from the freezer.

Brick Ice Cream—Ice Cream usually put up in pints or quarts and resembling a brick in shape. Most common shapes are the eastern (short) and western (long) brick. Of the many fancy molds for ice cream the brick is perhaps the most popular. In large up-to-date ice cream plants bricks are usually made in four or eight quart capacity metal trays or molds. Paper trays set in wire baskets to hold them in shape are also used. The trays are filled with quite firmly frozen ice cream direct from the freezer and are quickly placed in the hardening rooms. Usually only two slabs are filled from a 40-quart batch, the rest of the batch being drawn into a 5-gallon package thus avoiding too much variation in overrun. The trays may be filled with just one layer of ice cream or there may be two or three layers giving a chance for three different flavors and as many different colors in the brick. In order that the layers may show up distinctly and with sharp outlines the first layer must be properly leveled off and hardened before a second layer is added.

Center Mold Bricks are ice cream frozen in brick form with a center design of ice cream of a color and form suitable for the special occasion. When cut each slice will contain the design.

Layer Bricks Two or three layered colored bricks are good sellers. There are many possibilities in special designed bricks sliced bricks individual size etc.

Cannon Ball—The registered trade name of a product similar to chocolate covered ice cream bars except that it is in the form of a cannon ball and is poured into molds instead of being cut out of bricks.

Carbonated Ice Cream—A patented process by which ice cream is charged with carbon dioxide gas during the freezing process. While various claims have been made for carbonated ice cream a study of the process in the judgment of many shows it to have no special value.

Charlotte Freeze—A frozen dessert made with vegetable fats.

Choco-pop—Chocolate coated ice cream bar on a stick.

Chocude—A registered trade-mark of the Joe Lowe Corporation for a chocolate coated ice cream frozen confection on a stick.

Cold Dog—The registered trade name of a product similar to chocolate coated ice cream bars except that it is in cone form.

County Club—Same as Fro-Joy.

Creamsicle—An ice milk or ice cream center, 2 ounces in volume with a quiescently frozen outer section, making a total volume of 4 ounces, consisting of ice cream and sherbet of contrasting colors, one being an inner core and the other being an outer coating, on a stick. It is a registered trade mark of the Joe Lowe Corporation.

Custard—A frozen dessert made from a custard base of milk, eggs, and starch. Cream, sugar, and flavoring material are then added, and the mixture frozen. Most homemade ice creams are frozen custards.

Dazzle—A registered trade-mark of the Joe Lowe Corporation for a chocolate coated ice cream frozen confection having two sticks.

Doozy Bar—Two flavored, 3 ounce, brine tank piece on a stick, comprised of sherbet center and ice cream coating. May or may not be chocolate coated.

Dreamsicle—Same as Creamsicle except that it is 3 ounces total volume. It is a registered trade-mark of the Joe Lowe Corporation for a frozen confection on a stick consisting of any two of the following substances: ice cream, sherbet, ice milk, vegetable fat frozen dessert and water-ice, in contrasting colors, one being an inner core and the other being an outer coating.

Esquimo Pie—A chocolate-covered ice cream bar patented by C. Nelson in 1921, who took the special Ice Cream course at the University of Nebraska with the senior author of "Ice Creams and Other Frozen Desserts".

Fancy Form—Any one of many forms such as Turkey, Snow Man, Santa Claus. Made of ice cream in a special individual mold and decorated.

Free-Zee—A registered trade-mark of the Joe Lowe Corporation for a chocolate coated frozen confection on a stick consisting of either (1) ice cream, (2) ice milk, (3) vegetable fat frozen dessert or (4) sherbet.

Fro-Joy—A trade mark name used by General Ice Cream Corp. to identify one of its companion brands of ice cream other than Sealtest. The composition of the mix, and the flavor formula differs from that of "Sealtest" products.

Fudgsicle—A frozen confection, with or without overrun, with or without butterfat and usually containing sugar, stabilizer, milk solids-not-fat, chocolate flavoring.

A registered trade-mark of the Joe Lowe Corporation for (1) a quiescently and (2) an agitated frozen confection on a stick consisting of flavoring, sugar, stabilizer, milk solids and water.

Gelatin Cubes—Another new way of attracting trade is by introducing a very appealing and attractive specialty—fruit flavored gelatin cubes—which lend a new, distinct, and delicious flavor and color to ice cream. The fruit-flavored gelatin is made a little firmer than the usual jello pudding and then cut into cubes. These true fruit cubes of gelatin have been used in bricks, week-end specials, ice cream bars, and bulk ice cream. They are good for decorating and do not discolor the cream.

Glacé—A fancy ice cream made from whipped cream, egg whites, sugar, and flavor.

Ice Cream Cake—One or more layers of ice cream barded in cake tins, the sides and top being covered with a thin layer of whipped cream that has been flavored and sweetened after whipping. Decorations are then applied.

Ice Cream Cake, How Made—Ice Cream cakes are made in much the same way as the brick. Use any ordinary cake pan for the form. Cut a round hole the size of a dime in the center of the pan. Cover the hole with parchment paper before filling with ice cream. Fill about as in making brick ice cream. If the cake is to have several layers, it can still be made in a deep cake pan by letting the first layer harden before filling in the second, and so on for the third, taking care that each layer is hardened before the next one is poured in. Hence the ice cream maker can use his ingenuity in stacking the layers so as to have an artistic arrangement of colors and flavors. When the cake has been properly hardened it is ready to be defrosted and decorated.

Special molds for making a pre-cut cake are being made. This new, quick method enables the operator to fill segmented molds direct from the freezer or from the hopper. This new development will eliminate or reduce many manufacturing problems and also will provide pre-cut portions that can easily be separated when the cake reaches the consumer.

Modified Ice Cream Cake is made by placing alternate layers of ice cream and fruit flavored gelatin in cake pans. The gel is the same as that used in modified ice cream pies. It is desirable to have the gel filling for ice cream pies and cakes and modified afloat slightly weaker than that used for gelatin cubes. The pies and cakes may be decorated with whipped cream.

Ice Cream Pie—Generally a single layer of ice cream which has been hardened in a pie plate and appropriately decorated.

When ice cream pies are made in small quantities they are usually made by shaping and hardening a half-inch layer of slightly caramel-colored vanilla ice cream in a common pie plate. The shaping is more naturalistic if a second pie plate is set in the first with the ice cream between them while the hardening is taking place. They may be made as one-crust or as two-crust pies. After the crusts are hardened they may be filled with fruit ice cream or any other specially flavored ice cream or with preserved fruits which have first been hardened in a pie plate of a size to fit into the crust. If there is to be a top crust this is carefully inserted over the filling layer and the pie is ready for the decorator. The top surface of the pie is usually decorated with meringue or with whipped cream and given an oven-browned appearance by lightly spraying on a suitable coloring material with an atomizer. Where pies are made in large quantities rigid paper pie plates are used.

Modified Ice Cream Pies are made by using fruit flavored gelatin instead of the filling of preserved fruits or fruit ice cream which is ordinarily used. The fruit gelatin used in ice cream pies is similar to that used in modified afloat ice cream. The pie crusts are about one-half inch in thickness and may be made by hardening vanilla ice cream between two pie plates. Closed or open pies may be made.

Ice Cream Tarts are made from vanilla brick, cut into eight slices and again cut in halves trianglewise. A small dent is made in the center of one triangle and the depression filled with some highly colored fruit, the second triangle is fitted over this the sides are smoothed up, and the top sprinkled lightly with bisque crumbs. The tart thus formed is wrapped in wax paper and placed in the hardening room.

Ice Cream Waffles are made in waffle shaped molds which generally come in a size to make six or eight to the quart. These

molds are filled with vanilla ice cream. When hardened the molds are removed both sides of the waffle are covered with bisque crumbs, and two of these are placed together and wrapped in wax paper until ready to be served.

Rainbow Cones are made by putting thin spoonings of six or eight different colors of ice cream on top of each other, cone fashion.

Rainbow Ice Cream is made by carefully mixing (marble cake fashion) several different colors, as the product is drawn from the freezer.

Spumoni, a fancy ice cream generally made in cup-shaped form in pint or quart size. The outside layer is usually made of vanilla ice cream. In the bottom of this shell is placed macaroon or chocolate mouse and this is topped with tutti frutti mouse. In serving it is cut in wedge shaped pieces like cake.

Following is a suggested list of fancy ice cream specials for gatherings of various kinds:

Ice Cream for Special Occasions—

For Weddings and Showers—Decorated Cake. Individual molds such as slipper, bell, dove, bride and groom, tulip, heart, cupid, etc.

For Baby Showers—Decorated cake with emblems such as stork and baby. Individual molds of the same design.

For Bridge Parties—Decorated Cake. Individual molds of ace of hearts, clubs, spades and diamonds. Sometimes a stencil with similar designs can be used very satisfactorily on sliced bricks.

For Birthdays—Decorated cake with Happy Birthday and sometimes with numerals. Many individual molds with the stenciled numerals indicating age, class, etc.

For Children's Parties—Individual molds of elephant, engine, horse, butterfly, monkey, boat, cannon, etc., are some of the possibilities.

For Athletic Functions—Ice Cream cake in the form of a football or basketball. Individual forms showing an athlete or a football.

New Year's—Decorated cake featuring the baby New Year, or a bell as part of the decoration, or a brick with a bell center.

Lincoln's Birthday—Decorated cake. Bust of Lincoln, flag, and other patriotic decorations in individual molds or sliced brick.

Washington's Birthday—Decorated cake. Hatchet, flag, cherry tree, Washington bust either in cake or individual form.

St. Valentine's Day—Heart and cupid decorations on cake. Heart center or cupid center bricks and individual molds of same design.

St. Patrick's Day—Shamrock cake or shamrock center brick and countless individual molds, carrying out the shamrock idea.

Easter—Cake decorated with egg or lily. Individuals in the shape of lilies, eggs, or rabbits. Individual chickens or chicken center in bricks. Two-quart standing rabbit, etc., etc.

Mother's Day—Whipped cream decorations with "Best Wishes to Mother", "Many Happy Returns", etc. Carnations. Designs of assorted flowers.

Memorial Day—Special decorated cakes.

Fourth of July—Many individual designs such as flags, shield, cannon, liberty bell, etc. Red, white and blue bricks. Special cakes with patriotic decorations.

Hallowe'en—Individual pumpkin, witch, corn cob, black cat, owl designs. Special decorated cakes with these or combinations for decorations.

Thanksgiving—Special decorated cakes showing turkey, horn of plenty, pumpkin, or other decorations suggestive of Thanksgiving scenes. Individual designs of numerous kinds along this line may be secured.

Christmas—Special decorated cakes with "Merry Christmas" or other designs that appeal to various groups or nationalities may be used. Individuals may be made up in the form of a bell, stocking, Christmas tree, Santa Claus or Christmas tree centers may be featured.

Miniature Novelties—

Box of Strawberries—Delicious strawberry ice creams cleverly resemble nice, ripe, natural strawberries. The coating is a nearly perfect counterpart of the natural berry, both in color and flavor, and each berry has its green stem decoration. To complete the illusion they come packed in an ordinary

quart size strawberry box from which they are to be served. A novelty for children's parties and other small at home parties.

Ice Bowl of Assorted Fruit—Bowl of almost crystal clear ice is filled with individual ice creams flavored, molded, colored, and decorated to resemble miniature assorted fruits. Served in the ice bowl this is a surprisingly appealing dessert for special occasions.

Box of Bon-bons—A transparent semi-plastic box containing an assortment of ice creams of a variety of flavors, cut and molded into various shapes and decorated to resemble a box of fancy assorted candy bon-bons. Very attractive and especially suitable for special gifts for birthdays, for hospital patients and other occasions.

Bowl of Walnuts—Very cleverly shaped walnut ice cream shaped and decorated to appear as natural walnuts, usually packaged in a wooden bowl. A specialty for men's parties.

Fat Determination, in Ice Cream—For best results use A.O.A.C. method or Mojonnier test. See Dairy Tests.

Flavors, (for ice cream and sherbets)—Concentrates, emulsions and extracts in many fruit and other flavors. They should be delicate and mild to blend easily. Flavor in ice cream is generally considered the most important characteristic. It is usually the result of successful blending of the flavors of all the ingredients used.

Food Value—The food value of ice cream depends on the food value of the ingredients from which it is made. It contains 12 to 16% more protein than does whole milk and 3 to 4 times as much fat. In addition it may contain other food products such as fruit, nuts, eggs, sugar which add to its food value.

Like milk it does lack some of the trace minerals. It is rich in calcium and phosphorus. The protein content is high, both in amount and quality. Ice Cream is also a good source of food energy.

One quart of ice cream equals in food energy the following:

1.06 lb.	Angel cake
.69 "	Chocolate fudge
.61 "	Caramels
6.96 "	Apples
4.94 "	Raspberries
5.11 "	Bananas
8.75 "	Strawberries
10.63 "	Lemonade
3.58 "	Prepared Cocoa
3.42 "	Oyster Stew

Freezer—A machine of cylindrical shape with a refrigerated jacket revolving dasher, and scraper blades used in making ice cream. The cylinder may be horizontal or vertical although the former is nearly always used commercially. Inside the machine the dashers and scraper blades revolve in opposite directions at a speed varying from 120 to 240 R.P.M. The revolving parts whip the mix, keep it scraped free from the freezing surface and cause it to circulate throughout the freezer. Brine freezers in which cold brine is the refrigerating medium are still most commonly used although direct expansion freezers are becoming increasingly popular. Commercial freezers vary in size from a capacity of 40 to 160 quarts of finished ice cream.

A device for freezing ice cream consisting commonly of a tub for ice and salt, a can to hold the mixture to be frozen, a dasher and a rotating mechanism. The can is rotated in the freezing ice and salt mixture and its contents stirred by the dasher. This type now more or less obsolete except for home freezing of ice cream.

Freezer, Vogt—A continuous ice cream freezer. The ice cream is propelled through one or more 3-inch jacketed tubes equipped with mutator or dasher and scraper blades. This freezer propels the mix and air in controlled proportions through the freezing chamber and in that way attains control of the overrun and a stiffness of freezing considerably in excess of that which can be used with batch freezers. The mix and air are pumped into the machine by means of a 2-stage pump which introduces mix and air into the freezing chamber and then provides the pressure to force the product through the freezing chamber. The ice cream resulting has an especially fine smooth texture. The direct packaging of ice cream is readily possible with this machine.

Freezers, Types of—

- 1 Batch freezers
 - a Salt and Ice type
 - f Hand power vertical tub freezers used only in the home to-day
 - 2 Power driven vertical now used only in isolated areas
 - b Brine freezers
 - 1 Vertical—now used mostly in some makes of Counter Freezers
 - 2 Horizontal—rapidly becoming obsolete
- c Direct Expansion (refrigerant)

- 1 Vertical—used mainly in some Counter Freezers
- 2 Horizontal—widely used in modern factories at least for special purposes
- 2 Continuous freezers
 - f Horizontal direct expansion rapidly replacing batch freezers especially in large plants

Freezers, Ice Cream, Operation of—See "Ice Cream and Other Frozen Desserts"

Freezing Procedure of Ices—In the making of ices the freezing procedure is similar to that for ice cream.

Freezing Process, (Ice Cream)—Freezing the ice cream mix is one of the most important operations in the making of ice cream for upon it depends the quality, palatability and yield of the finished product. The freezing process may be divided into two parts: 1 The mix with the proper amount of color and flavoring material generally added at the freezer is quickly frozen while being agitated to incorporate air in such a way as to produce and control the formation of small ice crystals so necessary to give smoothness in body and texture, palatability and satisfactory overrun in the finished ice cream.

2 When the ice cream is partially frozen to a certain consistency it is drawn from the freezer into packages and quickly transferred to cold storage rooms where the freezing and hardening process is completed without agitation.

Frozen Malted—See **Frosted Malted**

Fruit Grades, (for ice cream)—A classification of fruits according to quality, color, freedom from blemishes, ripeness, size, uniformity and symmetry. The Canner's League of California specifies the following grades:

Fancy Grade represents fruit of superlative quality of very high color, ripe yet not over ripe, free from blemishes, very uniform in size and very symmetrical in appearance.

Choice Grade represents fruit of fine quality of high color, ripe yet not over ripe, free from blemishes, uniform in size and symmetrical and is usually one size smaller than the Fancy grade.

Standard Grade represents fruit of good quality, reasonably good color, reasonably free from blemishes, uniform in size, reasonably uniform in color and degree of ripeness and reasonably symmetrical.

Second Grade represents fruit of second quality, tolerably free from blemishes, tolerably uniform in size, color and ripeness and tolerably symmetrical.

Pie Grade represents fruit of pie quality that is wholesome fruit. It need not be uniform in size, maturity, color, or appearance, and may contain a few blemishes. It must not contain decomposed fruit.

Fruits, Candied, or Glacé—Candied cherries, pineapple and citron, and such candied fruit peels as orange, lemon, and grapefruit are very good flavoring materials. They are used chiefly in rich types of ice cream—puddings, auflaits, mousses—and as decorative material for fancy molded ice creams, and sherbets and ices.

Fruits, Dried—Dried apricots, figs, prunes and raisins make tasty ice creams. Although of slightly different flavor than the corresponding fresh fruit, they usually are less expensive and often can be obtained at times when fresh fruit is very scarce or in places where it is practically unobtainable. Dates, figs and raisins, particularly, have long been used in frozen puddings but recently there has been a tendency to use these and other dried fruits as flavoring material for ice cream either separately or in combinations.

Fruits, Fresh—Fresh fruit must be considered the best source of flavor when available at sufficiently low prices. Fresh fruit ice creams also have a special sales appeal. The fruit should be washed and hulled or peeled and then mixed with sugar in the ratio of 2:1 or 3:1 (i.e., 2 lb. fruit to 1 lb. sugar or 3 lb. fruit to 1 lb. sugar) and held at about 40° F. for 12 to 24 hours before using. During this aging period a large part of the juice and flavor of the fruit will combine with the sugar, by osmotic action, to form a fruit syrup. This syrup will impart to the ice cream the full flavor of the fruit much more effectively than would the fresh fruit used immediately. Strawberries need not be mashed or sliced as this is merely a waste of time and does not enhance their flavoring ability. Very seedy fruits such as raspberries should be pureed so that about $\frac{3}{4}$ of the seeds are removed. Peaches should be sliced.

Fruits, Kind of Pack to Use—Fresh or frozen packs are preferable for fruits such as strawberries whose distinctive flavor is easily impaired by heating; while fruits like cherries or pineapple, whose flavors are relatively stable or improved by heating, are usually heat-preserved, that is, canned. For strawberries the 2:1 and 3:1 frozen packs are the most popular, with the tendency toward the

latter. Peaches should also be frozen, the 3:1 pack being preferred. Raspberries are very satisfactory frozen, although they withstand heating much better than strawberries. Cherries are usually canned although the frozen fruit is satisfactory. The 2:1 ratio pack should be used in both cases. Generally the maraschino process cherries are used. Frozen pineapples are used occasionally and have a very fine flavor but the canned fruit flavor is also very popular.

Hardening Cabinets—These resemble the retail ice cream cabinet, and are refrigerated either by brine or mechanical refrigeration. The ice cream package is placed in the dry, water-tight compartments, each of which will hold one or two five-gallon containers. These are usually operated at a temperature between -10° and -15° F., are most economical for a limited volume of business, and avoid exposure of the operator to sudden chilling temperatures.

Hardening, (Ice Cream), Factors Affecting Time of—1. Depends on size and shape of package. 2. Air circulation. 3. Temperature of air. 4. Temperature of ice cream. 5. Composition of mix. 6. Per cent of overrun.

Hardening, (Ice Cream) with Ice and Salt—The hardening of ice cream may be accomplished by packing a mixture of ice and salt around the container. This method is commonly used by small manufacturers. The salt should be coarse (crushed rock salt) and placed both in and on the upper third of the ice. The amount of salt used should be one-fifth of the weight of the ice (i.e., 1 lb. of salt for every 5 lb. of ice); never more than one-fourth or less than one-sixth.

Hardening Process—When ice cream is drawn from the freezer and put into the container to be placed in the hardening room it has a semi-fluid consistency not stiff enough to hold its shape. Therefore the freezing process is continued without agitation until the temperature of the ice cream reaches 0° F. or lower. Here, as in the freezer, it is desirable to get quick freezing or quick hardening, since slow hardening favors large ice crystals and coarseness.

Hardening Rooms—Rooms where the packaged ice cream is placed in dry air maintained at a temperature between -10° and -50° F. are used to harden ice cream. Most factories employ ammonia as the refrigerant to maintain a temperature of -20° or -25° F. For economical operation, the hardening room should be entered through an ante-room which may be large enough to permit storage of some ingredients at about 30° F.

Hardening Tunnels—Some manufacturers of large volumes are using hardening tunnels containing an air blast at -30° to -40° F for fast hardening. These may or may not contain a conveyor belt and have their greatest advantages when hardening the smaller packages which take no more than one hour.

High Fat and High Serum Solids Ice Creams—When ice cream is made and sold under the usual commercial conditions of large scale operation it contains between 36 and 41% total solids, and is acceptable to the largest group of consumers. Ice cream containing more than 41% total solids is frequently called high-solids ice cream and seems to be preferred in certain limited or special markets. It contains a larger amount of the expensive milk fat solids than is found in the ordinary commercial ice cream. A noticeable characteristic is that it does not melt down to a smooth creamy liquid. The term high-solids ice cream also may be applied to ice cream which contains less than 41% total solids but has a greater concentration of serum solids than the maximum usually prescribed.

High Serum Solids Ice Cream has been made in the western part of the United States for a long time. It is made by using such specially prepared products as soluble casein and low lactose skim milk powder. These ingredients increase the "chewiness" and the percentage of desirable milk proteins while at the same time avoiding the lactose concentration which so often causes sandiness. It is also one way of avoiding the high fat content or excessive richness. High serum solids ice cream always contains a higher concentration of serum solids than the maximum but may contain less than 41% total solids provided the fat is less than 14% and no corn syrup solids are used.

High Fat Ice Cream contains more than 16% fat and more than 40% total solids. Such ice cream rich and smooth in texture has been a favorite particularly in New England where it is often featured and sold at the roadside stand or dairy stand. These stands are generally located along heavily traveled roads with ample parking space around the stand so that customers may be served in their cars. This ice cream usually contains 20% fat or more, all ingredients are of high quality and it is generally frozen on the premises.

High Whipping Ability—The ability to whip rapidly to a high over run depends on the viscosity of the mix. The present theory is that whipping ability is based on tensile

strength, and the strength of the lamellae, that is the walls around the air cells. Whipping ability is improved by high processing temperatures, good homogenization and aging of the mix from 2 to 4 hours.

Hopper System—A system of handling ice cream in plants where there are no continuous freezers. By this method, ice cream is discharged from the freezers into a cooled and insulated hopper. The hopper is generally so placed as to receive the ice cream from a number of freezers saving freezer capacity. Packages and cans can be featurally filled from the hopper. There are many kinds of hoppers some have a hand operated valve and other automatically fill in a measured amount as the cans or packages pass by on a conveyor enroute to the hardening room.

Ice Bunker Refrigeration—A common method of refrigeration in small plants. Ice is placed in a bunker near the top of the refrigerator usually at one end in such a manner that the warm moist air will enter the bunker at the top pass over the ice and then be recirculated as dry, cool air. Not used in modern creameries but is similar to refrigerated cars.

Ice Cream, History of—Often called "The Great American Dessert." Ice Cream was introduced originally in Europe but its development has almost wholly taken place in the United States.

Records of frozen ices have been found in European history of the 16th century. The first printed record of "cream ice" appeared in "The Experienced English Housekeeper" in 1769.

The introduction of ice cream into the United States has been credited to Mrs. Alexander Hamilton. Records indicate that ice cream was advertised in the New York Gazette in 1779.

Records kept by George Washington show the "purchase of a machine for making ice cream."

The bulk of ice cream making was a household task until 1851 when Jacob Fussell, a Baltimore milk dealer, started the first business of wholesale ice cream manufacture.

ICE CREAM FORMULAS

Aufait—A molded ice cream and fruit combination consisting of two or more layers of ice cream with pectinized fruit spread between the layers. Strawberry Aufait. Fill a

brick mold half full with vanilla ice cream; harden; spread over this a layer of pectinized strawberries (not too thick since it is difficult to cut through the fruit layer when it hardens); harden; and finish filling the mold with vanilla or strawberry ice cream. Many variations both as to number of layers and combinations of fruits are possible. Aufaits are also made in bulk by gently stirring the pectinized fruit into the ice cream as it comes from the freezer. The fruit should be heavy enough and cold enough so that it will make a more or less continuous line in the ice cream, giving a marbled effect.

Banana—Four pounds of very ripe bananas crushed and mixed with one pound of sugar. Use this with 4.5 gallons of mix. Color light yellow. Often a small amount of lemon juice or citric acid is added to prevent a slightly flat taste.

Bisque—This is a type of ice cream made by adding a bakery product to the partly frozen mix. To the full 5-gallon mix in the freezer add 2 to 4 pounds of either macaroons, sponge cake, lady fingers, grape nuts, chocolate chips or similar product, broken in small pieces. The ice cream carries the name of the product used as the flavor.

Bisquit Tortoni—A Neapolitan ice cream to which is added, when partly frozen, heavy or medium heavy sweet cream. A further modification of this specialty is the addition of meringue and macaroons just before drawing from the freezer.

Burnt Almond—Five gallons of mix plus 2 lb. burnt or roasted almonds. Almond flavor may also be added, as well as some burnt sugar or caramel color.

Butter Crunch—Five gallons of mix plus 3 lb. of ground butter crunch candy.

Butter Pecan—Add 1.5 lb. of ground butter crunch candy plus 1 lb. of chopped pecans to 5 gallons mix.

Butterscotch—Four and one half gallons of mix and 2 quarts of butterscotch syrup; color to egg yellow.

Caramel—Five gallons of mix and enough caramel flavor to impart a satisfactory caramel taste and color. The color should be a deep tan.

Charlotte—A dessert of fruit, cream, ice cream, or other confection, enclosed in a form of bread or cake.

Cherry—Two to 3 quarts of cherries added to 4.5 gallons of mix at the freezer. Usually maraschino process cherries are used. If processed cherries are not used, it is necessary to select sour cherries and use cherry extract to strengthen the flavor. Color light red.

Chocolate—To 4.5 gallons of mix add chocolate syrup made from 1.5 lb. cocoa (or 2 lb. chocolate liquor), 1.5 lb. sugar, add 2 to 3 quarts of water. Mix the cocoa and sugar together and add enough water to make a paste. Heat in a steam jacketed kettle or double boiler. As the syrup thickens, add the water gradually, with constant stirring. Heat to 175° F., draw off the syrup, cool and use. Just enough water to prevent an excessively thick syrup need be used. The syrup can be made up in quantity and stored for a few days in the cold storage room (35° to 40° F.).

Chocolate Malt—One-half the chocolate syrup used for chocolate ice cream, 1 quart of malt syrup, and 4.5 gallons mix. If malt syrup is not available, use one to two pounds of malted milk.

Coffee—Five gallons of mix plus one pint of coffee extract. A strong coffee cooked from one pound of ground coffee may be used in place of the coffee extract. A suitable amount of burnt sugar color should be added.

Diabetic Ice Cream—There is some call for an ice cream low in carbohydrate and sugar content for those who suffer from diabetes. The following formula may help meet this demand: For a 5-gallon mix use 3.25 gallons 30% cream, 1.75 gallons skim milk, 7 fresh eggs, 3.5 ounces gelatin, 3.5 ounces saccharin, 1.75 lb. glycerine. The eggs, gelatin and saccharin are blended with the milk products, pasteurized and homogenized in the same manner as in making other ice cream mixes. The 1.75 lb. glycerine is added at the freezer when the desired color and flavor are added. It is imperative that the sugar content of the flavoring be held to the minimum; therefore vanilla, mint, and lemon are most satisfactory. Fruits such as pineapple, peaches, and apricots when well ripened can be used but are less satisfactory in this type of ice cream. Since the use of saccharin in ice cream is illegal in many states, special permission from health authorities must be secured.

Suggested Formula, (using Sorbitol) for Diabetics¹—For 100 gallons

- 400.2 lb 35% cream
- 234.9 lb 3.5% milk
- 139.2 lb Sorbitol solution (Arlax)²
- 3.5 lb gelatin (275 bloom)
- 43.5 lb whole egg³
- 48.7 lb of water
- 43.5 grams saccharin

This ice cream will contain 628 calories per pint at 80% overrun. Its composition will be as follows: 17% milk fat, 5.1% milk solids not fat, 16.0% Sorbitol solution, 0.4% gelatin, 5.0% liquid whole eggs, 5 grams saccharin per 100 lb mix.

English Plum Pudding—To 5 gallons part fat mix to which has been added 1½ lb of chocolate syrup, add the following fruits and nuts after the mix is partly frozen:

- 1 lb figs
- 4 lb mixed candied fruits
- 1 lb pecans
- 1 teaspoon each of ginger, allspice and cloves
- 1 lb dates
- 1 lb walnuts
- 3 teaspoons cinnamon
- 4 ounces vanilla extract

Fruits and nuts should be chopped and may be mixed with the spices before they are added to the partly frozen mix or the spices may be added to the mix before freezing begins.

Ginger—To 5 gallons mix add 4 lb preserved chopped ginger root. Or add a No. 10 can of ginger root flavoring.

Fig—Add to 4.5 gallons of mix 2 to 3 quarts of canned figs. Color light tan. A good fig nut ice cream can be made using 2 quarts of canned figs and one pound of chopped nut meats.

French Ice Cream—An ice cream characterized by a liberal amount of eggs which are cooked in the mix before freezing. It is also called Parfait, New York or Neapolitan Ice Cream.

Frosted Malted—A special low fat high solids mix ice cream containing cocoa and

malt. The formula is as follows: 1.8 gals 12% ice cream mix, 41.5 lb 26% condensed skim, 12 lb sugar, 2 lb Cerelease, 2.2 lb cocoa, 2 ozs gelatin, 9 ozs pectin, 3 lb malted milk, and sufficient water to make 10 gals of mix.

In serving the frosted malteds, two No. 16 dippers of the special ice cream are added to 3½ ounces of whole milk and mixed in a fountain mixer. The amount of mixing should be the least required to break up the frozen product.

Frosted Malted, Chocolate—To 3.5 gallons of ice milk mix add 1 quart malt syrup (or 1 to 2 lb malted milk powder) and chocolate syrup made from ¾ lb cocoa (or 1 lb chocolate liquor), ¾ lb sugar and 1 to 1½ quarts water. (Make syrup as directed for Chocolate Ice Cream). Freeze and serve from freezer.

Frozen Pudding—Usually a prepared mixture is used. However, if nut meats and rum or rum flavor are added to tutti frutti ice cream, a frozen pudding flavor is the result.

Fruit Ice Cream—Ice cream made from the same mixes as plain ice cream but with the addition of various fruits at the time of freezing.

Fruit Salad—As generally made, this consists of fairly large pieces of mixed fruits in combination with whipped cream or ice cream. Pineapple sliced or cubed, red cherries, apricots, peaches, pears or prunes, properly pitted and sliced, are gently folded into the stiffly whipped cream which has been flavored to taste with a good brand of mayonnaise. This mixture is set to stiffen somewhat before it is placed in molds to harden. A good formula is about as follows: One gallon fruit mixture to ½ gal. whipped cream (mayonnaise-flavored). For variation, ¾ gallon of softened vanilla ice cream may be substituted for the whipped cream.

Honey Ice Cream—Ice cream in which about ½ of the sugar has been replaced with honey in order to give the characteristically honey flavor.

Ice Milk—Thoroughly mix 4 ounces gelatin with 6.75 lb sugar. While stirring and beating 3.25 gallons of homogenized 4% milk, slowly add the mixed sugar and gelatin. Continue stirring and heating until a temperature of 120° F. has been maintained for 20 minutes. Then cool to about 80° F. and add 12 cans (14 ounces each) of evaporated milk. This will yield 45 lb of ice milk mix to which any desired color and flavor may be added.

¹ Suggested by Dr. P. H. Tracy and George Edman, Department of Food Technology, Univ. of Illinois, in the Ice Cream Trade Journal (July 1950).

² Sorbitol is used as a substitute for sucrose. Its chief value lies in the delay which occurs before the sorbitol appears in the blood as glucose and its low carbohydrate and insulin values.

³ Or 12.75 lb powdered whole eggs plus 30.75 lb water.

Maple—Five gallons of mix plus true or imitation maple flavor to suit the taste. A pure maple extract or concentrate is preferable to the use of maple syrup. If maple syrup is used, a special mix containing only 10 to 12% sugar must be used.

Maple Walnut—To maple ice cream add 1 to 2 lb. of chopped nut meats at the freezer.

Maple Pecan—Same as above except use pecan meats.

Mint—Five gallons of mix flavored to taste with mint extract. Color light green.

Mocha—Same amount of mix and chocolate syrup as for chocolate malt plus 4 to 6 ounces of coffee syrup, or enough to give a mild coffee flavor.

Mousse—Whip one gallon of 40% cream to a stiff consistency. Gently stir in 2 lb. sugar, a drop or two of desired color, and one-half to one ounce of vanilla. Dates, nuts or fruits free from excessive juice, chopped into rather small pieces, can also be gently stirred in. The mixture is then placed in molds of the desired shape and is frozen in the hardening room without further agitation. This will yield about two and a half gallons of finished mousse.

Neopolitan Ice Cream—Same as New York or Parfait; also called French. This class of ice cream is noted for its generous content of egg yolks. To each gallon of regular mix 10 to 20 egg yolks, about .4 to .8 lb., are added. These fresh egg yolks should be thoroughly beaten to break up all structure before they are added. To maintain proper sweetness in the mix, add 0.1 lb. of sugar for every 10 egg yolks used. A custard can be made by cooking the egg yolks in the regular mix (1½ to 3 lb. of egg yolks and 4 or 5 times this weight of regular mix) in a jacketed kettle to 180°F. and holding that temperature, with constant stirring, until custard is formed.

Nesselrode Pudding—To 5 gallons of rich mix (similar to parfait mix), add 3 to 4 quarts of a special commercial fruit mixture suitable for Nesselrode Pudding. This should be added after the mix is partly frozen. Or prepare a mixture of the following fruits chopped into small pieces:

- 1 pint crushed pineapple (cooked)
- 1 pint candied cherries
- 1 pint maraschino cherries
- 1 pint raisins
- 6 ounces candied orange peel
- 1 lb. each of walnuts, almonds, and pecans chopped or coarsely ground. Color light orange.

Standard plain mix is often used instead of the richer mix in making puddings.

Orange—Use 2 quarts fresh or canned orange juice or the equivalent of orange concentrate (frozen), plus 1 pint of lemon juice; add 1.5 lb. of sugar to the juice. An orange extract is often substituted for a part or all of the juice. Color light orange. Add 4.5 gallons of mix.

Orange Pineapple—Usually 2 quarts of a prepared flavor is used which consists of crushed pineapple mixed with orange oil or emulsion. Use 4.5 gallons of mix. Color light orange.

Parfait—This requires 4.5 gallons of high-fat (16%) mix and 3.5 dozen fresh eggs. The eggs are added to about a gallon of the mix which is then cooked to a custard (about 160° F. for 30 minutes) and cooled to below 100° F. This custard is then added to the remaining part of the 4.5 gallons of high fat mix. The resulting 5 gallons of parfait mix can be used like an ordinary ice cream mix to make any flavor desired, as vanilla, chocolate, strawberry, butterscotch and maple nut parfaits, etc.

Peach—Four gallons of mix flavored with 1 gallon of sweetened (25% sugar by weight) fresh fruit or pie grade canned peaches. Peach extract is frequently used to fortify the mild fruit flavor. Color light egg yellow.

Peanut Brittle—Crush or grind 2 to 3 lb. of peanut brittle. Add this at the freezer to 5 gallons of mix.

Peppermint Stick—Crush or grind through a meat chopper 2 lb. of peppermint stick candy. Use this to flavor 5 gallons of mix.

Pineapple—Two to three quarts of pie grade shredded or crushed pineapple, plus 4.5 gallons mix. Color light yellow.

Pistachio—To 5 gallons of mix add 2 pounds chopped pistachio nut meats, pistachio extract to taste, and color to light green. Frequently English walnuts or pecan nut meats are used instead of pistachio nuts, in which case the pistachio flavor is secured from the extract.

Rainbow Ice Cream—Carefully mix 6 or more different colored ice creams while they are soft (as drawn from the freezers) to give a marbled or rainbow colored effect. Then set in the hardening room to harden.

Raspberry—Four and one half gallons of mix plus 2 to 3 quarts of raspberries added at the freezer. Since raspberries are very seedy pureed raspberries are frequently used. Addition of true fruit raspberry extract to strengthen the flavor is often practiced. Often a small amount of citric acid is added to bring out the flavor.

Rippled Ice Cream—As the plain vanilla ice cream is drawn from the freezer into the package specially prepared syrups (such as chocolate butterscotch etc.) are added by means of a special nozzle so as to produce a marbled effect. Thus a stream of soft ice cream and a stream of the specially prepared syrup enter the package in the desired ratio and are slightly stirred to give a marbled effect. The syrups usually contain about one half to one per cent stabilizer.

"Soft" Ice Cream—At present there is a marked demand for this new form of ice which has generally come to be known as "soft ice cream." Perhaps this term has been applied to it largely because it is marketed in soft form and for consumption shortly after it is drawn from the freezer. The fact that it is marketed under these conditions makes it possible to use a formula with a considerably larger quantity of serum solids than is found in the usual formulas.

Formula for "Soft" Ice Cream—A good formula for soft ice cream would be about as follows:

0.50 lb. Shervel (stabilizer) or gelatin—12% fat

13.00 lb. sugar—14% serum solids

8.27 lb. skim milk powder—15% sweetening effect

24.62 lb. cream (40% fat)—0.5% stabilizer

53.81 lb. milk (4% fat)—39.5% total solids

Any desired flavoring can be used. The mix weight is 9.17 lb. per gallon. A desirable finished product will have approximately 100% overrun and will weigh 4.6 lb. per gallon.

Note the difference in serum solids in this special formula as compared with that of a good average standard formula such as is suitable for ordinary hard ice cream where one has to guard against lactose crystallization—the usual cause of "sandy" ice cream.

Spumoni—A special spumoni cup should be used. Press one fourth of a spumoni cupful of vanilla ice cream around the sides and

bottom to line the cup. Add chocolate ice cream to half fill the cup. Finish filling with a mixture of fruit and whipped cream and then place in the hardening room. The fruit and whipped cream mixture is prepared by whipping 10 pound confectioner's sugar with 10 gallon of heavy cream then gently stirring in the fruit from which excessive juice has been drained.

Strawberry—Use 4.5 gallon mix plus 3 quarts of fresh berries (washed, mixed with one-half their weight of sugar and held overnight in the cold storage room) or the same amount of frozen (cold pack) berries.

Tutti Frutti—To 4.5 gallons of mix add 2 to 4 quarts of a mixture of several fruits color to light pink. Usually a prepared fruit mixture is used.

Vanilla—From 3 to 6 ounces to flavor 3 gallons of plain mix. The amount to use varies with the strength of the vanilla quality of the mix and personal preference.

Other Formulas—Many additional colors, flavors and styles of package are quite suitable for use as frozen desserts. The alert and ingenious ice cream maker with the aid of his trade association publications and other suggestions will be able to develop new flavor combinations and more attractive style of packages. Supply houses are constantly offering new and interesting creations that should help him in increasing his sales and in successfully meeting competition.

FROZEN ICES AND SHERBETS

Frappe—An ice consisting of water, sugar and flavoring material frozen to a slushy consistency and served in that condition.

Formula—Juice of 3 dozen lemons and 3 dozen oranges, 2 quarts grape juice, 5 pounds sugar and water enough to make 5 gallons. This is made in the same manner as an ice except that it is not hardened. Since frappes are served in a soft condition they ought preferably to be frozen just prior to serving. Many other fruit mixtures pleasing to taste can easily be developed.

Frozen Suckers—A frozen ice, patterned after a candy sucker or lollipop. The ice mix is frozen in suitable forms with wooden handles inserted. Various trade names have been applied to these suckers such as "Pop-side," "Cheerio Bar," etc.

Formula for Frozen Sucker Base—Yields 38 Dozen Suckers—Water, 10 gallons; Cane Sugar, 15 lb.; Gelatin, 5 ounces.

Dissolve the sugar in $9\frac{1}{2}$ gallons of water. Do not use heat. Soak gelatin in a small amount of cold water until it swells and becomes soft—then dissolve by stirring and adding sufficient hot water to make one-half gallon of solution. Stir hot gelatin solution into sugar-water mix. Add flavor and acid as recommended below. No color to add. Color present in flavor. Add citric acid solution last. Flavored sucker base should be thoroughly agitated in mixing tank before pouring into the molds. Do not run through freezer.

Frozen Suckers, Ices and Sherbets, Standard Acid Solution (50%) for—Citric or Tartaric Acid Crystals—4 lb. Hot water to complete 1.0 gallon finished solution.

Orange—Orange (Natural), 4 to 5 ounces; Citric Acid Solution 50%, 6 to 7 ounces.

Limes—Limes Green (Natural), 4 to 5 ounces; Citric Acid Solution 50%, 14 to 15 ounces.

Grape—Grape Imitation, 4 to 5 ounces; Citric Acid Solution 50%, 8 to 10 ounces.

Raspberry—Raspberry Imitation, 4 to 5 ounces; Citric Acid Solution 50%, 5 to 6 ounces.

Lemon—Lemon Yellow (Natural) 4 to 5 ounces; Citric Acid Solution 50%, 10 to 11 ounces.

Cherry—Cherry Imitation, 4 to 5 ounces; Citric Acid Solution 50%, 6 to 8 ounces.

Pineapple—Pineapple Imitation, 4 to 5 ounces; Citric Acid Solution 50%, 5 to 6 ounces.

Strawberry—Strawberry Imitation, 4 to 5 ounces; Citric Acid Solution 50%, 5 to 6 ounces.

Banana—Banana Imitation, 1 to 2 ounces; Citric Acid Solution 50%, 4 to 5 ounces.

Granite—This is made from the same ingredients as an ice hut is frozen much harder and with but little whipping or stirring during the freezing process. The result is a coarser textured product than an ice.

Lacto—This product is a milk sherbet made from cultured sour milk, buttermilk, or fermented milk. For grape lacto use 3 gallons cultured sour milk, 9 pounds sugar, 12 eggs, $1\frac{1}{2}$ pints lemon juice, 1 quart grape juice. Dissolve sugar in the milk. Add fruit juices and beaten egg yolks. Whip egg whites and add at the freezer. Other popular flavors can be made by substituting raspberry, cherry, or orange juice for the grape juice.

Punch—An ice in which fruit juices have been reinforced with an alcoholic beverage. Often rum flavoring (non-alcoholic) is used instead of liquor. The following formula is used extensively: To about 7 gallons of water add 20 lb. sugar, 1 quart lemon juice, 1 quart grape juice, and rum flavoring as desired. If it is to be served in frozen form, 5 ounces of stabilizer should be added to the mixture.

Sherbet—A frozen mixture of water, sugar, flavoring, stabilizer, and a milk product (milk, cream, or ice cream mix). It differs from an ice in that it contains a milk product, and from an ice cream in its much higher sugar content, more pronounced acid and fruit flavor, much smaller amount of fat and serum solids, and much lower overrun, usually between 35 and 45%.

Formula—Dissolve 11.0 lb. sugar and 4.0 ounces stabilizer in 2.75 gallons water. When cooled below 50° F. add 3.25 quarts of ice cream mix and 1.0 gallon colorless corn syrup. At the freezer add 1.0 gallon of pureed fruit or fruit together with the desired amount of color and citric acid solution. When frozen, this mixture will yield about 9 gallons of finished sherbet.

Soufflé—This product is made from sherbet mixes, except that whole eggs are added and the freezing is done with sufficiently high overrun to give a fluffy product. The following formula is often used.

1 gallon strawberries (frozen pack)

$3\frac{1}{2}$ dozen eggs

12 pounds sugar

3 gallons skim milk or 3 gallons water

By substituting only the fruit used as flavoring many other soufflés can be made.

Water Ice—Dissolve 8 lb. sugar and 5 ounces stabilizer in 3.5 gallons of water, and then add one gallon of colorless corn syrup. Cool to below 50° F. and add one gallon of pureed fruit or fruit juices together with the desired amount of color and citric acid solution. When frozen this mixture will yield about 8 gallons.

End of Formulas.

Ice Cream Mix—The mixture which is frozen into ice cream in a freezer. Milk, cream, sugar, flavoring and gelatin are the ingredients commonly used. Egg solids, fruits and nuts, and other substances may also be added. This mixture contains 10 to 12% butterfat, 9.5 to 10.5% milk solids-not-fat, 15.5% cane sugar, 2-3% stabilizer and approximately 62% water. This is pasteurized at 155 to 160° F. for 30 minutes, homogenized and cooled prior to freezing.

Ice Cream Sandwich—Ice Cream contained between two sandwich wafers (usually chocolate flavored)

Ice Cream Tarts—A cup containing ice cream fruit syrup and decorated with whipped cream rosettes

Ice Milk—A frozen dairy product, in appearance simulating ice cream, but differing in composition. Its chief ingredients are milk, sugar, and flavoring. A summary analysis of several ice milk samples gives the composition and weight as follows:

Av. wt. per gallon	6.92 lb
Av. food solids per gallon	1.23 lb
Av. milk fat	4.00 %
Av. stabilizer	0.6 %
Egg yolk per gallon	1.5 lb

This product does not come within the legal standards for ice cream but is often sold under such names as Dairy Fluff, Mari gold Freeze, Frozen Custard etc. California led the states in providing by law that this product be labeled, advertised, and sold on its own merits as Ice Milk.

Ice Pop—See Popsicle

Icers—Icers are distinguished by having a tart or acid flavor and no milk solids. Other characteristics that differentiate them from fruit ice cream are (1) a much lower overrun, usually 25 to 30%, (2) a more pronounced fruit flavor, (3) a coarser texture, (4) a higher sugar content between 25 and 35% which gives a lower melting point, (5) greater cooling ability while being consumed due to their lower melting point, faster melting and coarser texture, and (6) an apparent lack of richness due to their lower solids content. While they constitute only a small part of the total gallonage in the ice cream factory they are important as relishes, summer delicacies and in combination with ice cream in fancy ice creams and specialties.

Ice Tray Package—Factory packed ice cream package designed to fit in the ice tray of home refrigerators.

"Improvers," for Ice Cream—Commercial products sold under special trade names and used to improve the quality of ice cream or the ice cream mix. Improvers are of two kinds: (1) Enzymatic improvers which rely upon a coagulating enzyme such as rennin or pepsin and (2) Non-enzymatic

improvers which are principally mixtures of various stabilizers such as gelatin, agar, agar, or gums. Improvers are not advisable for use in ice cream of 36% or more total solids content, although they may be used to advantage in unhomogenized mixes of low solids content. With enzymatic improvers coagulation may proceed too far, causing the mix to become a total loss or causing shrinkage in storage with a curdled appearance on melting. Non-enzymatic improvers, usually ordinary stabilizers, can be bought more cheaply on the open market than under special trade names.

Insulated Packers, for Ice Cream—These packers are commonly used for short distances (a maximum of 6 to 8 hours) where the packer remains closed during the entire time. Double-walled insulated canvas containers are the most common.

Precautions to observe in their use are:

(1) Thoroughly chill in the hardening room (about 4 hours) before loading them with ice cream. This requires extra space in the hardening room. (2) Avoid getting them dirty since they cannot be easily cleaned to make an attractive package so necessary and desirable for a food product. (3) Avoid getting them waterlogged. Insulation loses most of its efficiency when wet. (4) Keep them closed tightly. Any air vent reduces the efficiency of the insulation.

Invert Sugar—A mixture of equal parts of glucose and fructose resulting from the hydrolysis of sucrose by heating it in a dilute acid solution. Glucose is only about 80% as sweet as sucrose but since fructose is almost twice as sweet as sucrose, the resulting invert sugar is 14 times as sweet as sucrose. One disadvantage of invert sugar in ice cream manufacture is that it greatly lowers the freezing point much the same as does glucose. It is generally obtained in the form of a syrup. Directions for making are given in "Ice Cream and Other Frozen Desserts" by Frandsen and Nelson.

Irish Moss—A product containing the basic stabilizing principle carrageenin. This is extracted from carrageen (Irish moss), a seaweed growing on the coast of Massachusetts, France and Ireland. In stabilizing value it is comparable to a 250 Bloom Test gelatin, and, it is claimed, can be added to the mix as easily as gelatin.

Lamellae—1. Minute membranous films. In ice cream they are microscopic films of the ice cream mix spread out to enclose the air to form air-cells during the stirring and beating process. The stronger these lamellae, the more stable the air-cells which are formed. When as many stable air-cells as possible have been formed by the lamellae of the mix, the latter is greatly expanded in volume. This expansion is called overrun. 2. Colloidal films at the liquid-air interface in a liquid-air system.

Lime, its use as a Neutralizer—Lime is used to a limited extent as a neutralizer of excess acids in cream and in ice cream mixes. It has a desirable influence on flavor but is not as satisfactory as some neutralizers on viscosity and the whipping ability of ice cream mixes.

Liquid Sugar or No. 1 Syrup—Trade designations for the colorless sucrose syrup used by many ice cream manufacturers. It is generally purchased on a definite Brix reading which indicates both the sucrose content and percentage of total solids of the syrup. Generally this solution is marketed at about 67% concentration.

Loose Ice Cream—A term quite generally applied to bulk ice cream in England, New Zealand, Australia and to some extent in this country.

Maltsicle—A registered trade-mark of the Joe Lowe Corporation for a quiescently frozen and an agitated frozen confection on a stick consisting of malt flavoring, sugar, stabilizer, milk solids and water.

Milestones of the Ice Cream Industry—The following list of approximate dates of some of the important methods of processing and merchandising tells briefly the development of the ice cream industry:

- 1777 The New York Gazette carried ice cream advertising.
- 1811 Dolly Madison served ice cream at the White House.
- 1818 Patents granted on a revolving household type of hand freezer with dasher.
- 1851 Wholesale production started in Baltimore.
- 1876 Ice cream soda introduced at Centennial Exposition, Philadelphia.
- 1892 The Pennsylvania State College established the first course in ice cream making.
- 1902 The horizontal, circulating brine freezer was invented.

1911 The homogenizing process was applied to evaporated milk.

1913 The continuous freezing process was patented. Although this was essentially the same as the present process it was not widely used for a number of years.

1920 Ice cream was pretty generally recognized as a protective and essential food.

1920 Packaging machines for ice cream appeared.

1921 "Eskimo Pie" was patented. The first of the coated ice creams and novelty sticks.

1925 Solid CO₂ (dry ice) was used to facilitate delivery of ice cream.

1929-1934 Rapid development and acceptance of continuous (sometimes called "instant") freezers.

1940-1945 Development of "Deep Freeze" units for the home.

Some of the factors contributing to the recent development of the ice cream industry are:

1. The perfection of mechanical refrigeration and its application to the food industry.
2. Improved manufacturing methods and equipment such as the homogenizer, overrun testers, continuous freezers, packaging machines, etc.
3. More and better ingredients and more knowledge concerning ice cream making, resulting in a better product.
4. Lower manufacturing costs through mass production.
5. Extensive advertising of the product.
6. A realization of the high food value of ice cream.
7. Changing economic conditions—better wages, more purchasing power, a higher standard of living.

Milk Ice—A milk sherbet. A semi-frozen product made of the same ingredients as water ice, with the addition of milk or milk products. It contains milk, sugar, fruit, juice, and may or may not contain added color, flavor, fruit acid, and stabilizer.

Milk-Nickel—A registered trade-mark of the Joe Lowe Corporation for a chocolate coated frozen confection on a stick consisting of either (1) ice-milk or (2) vegetable fat frozen dessert.

Mousse—A frozen dessert consisting of whipped cream to which sugar and natural flavoring have been added.

Nesselrode Pudding—A highly flavored ice cream named in honor of Karl Robert Nesselrode Chancellor of the Russian Empire who lived during the period 1780-1862.

This ice cream usually has a vanilla Neapolitan base to which nuts assorted fruits and brandy may be added.

New York Ice Cream—See Parfait.

Nib-Lic—A registered trademark of the Joe Lowe Corporation for a chocolate coated frozen confection on a stick consisting of either (1) sherbet (2) ice milk or (3) vegetable fat frozen dessert.

Niftee—A registered trademark of the Joe Lowe Corporation for a chocolate coated frozen confection on a stick consisting of either (1) ice milk or (2) vegetable fat frozen dessert.

Nikl Stikl—A registered trademark of the Joe Lowe Corporation for a chocolate coated frozen confection on a stick consisting of either (1) ice milk or (2) vegetable fat frozen dessert.

Novelties, (Ice Cream)—Trade term for a group of ice cream products including Frosticks Popsicles ice cream sandwiches and other similar items.

Nut Ice Cream—Ice cream frozen from the regular mix but containing in addition various nuts such as walnuts almonds pistachios etc.

Nut Meats and Nut Extracts—Nut meats and nut extracts are quite extensively used as flavorings in ice cream. Pecans walnuts almonds pistachio filberts and peanuts are among the most popular. Nut meats should be sound and clean and free from rancid flavors. They should be stored in tight containers in a cool place until used. Considerable care should be used in preparing them for the ice cream mix to make certain no foreign material such as pieces of shell or pieces of wood and nails from containers get into the mix. Some nuts such as almonds filberts and pistachios should be blanched to remove their dark outer skin.

Nut Roll—A round pint ice cream roll consisting of ice cream with a fruit center core and rolled in buttered roasted chopped nuts.

Oil of Cinnamon—The essential oil of cinnamon used to a limited extent in chocolate ice cream by some ice cream manufacturers.

Overrun—Means the amount of air that has been incorporated in the ice cream in the making process. This is generally spoken of as the per cent of overrun. In other words overrun is the increase in volume of the ice cream over the volume of ice cream mix. The formula is expressed as follows:

$$\% \text{ Overrun} = \frac{\text{Volume of Ice Cream} - \text{Volume of Mix}}{\text{Volume of Mix}} \times 100$$

Overrun, Control of in Ices—Controlling the overrun is very important in ices. A high overrun favors syrup drainage a lack of firmness and poor body. Therefore stabilizers that improve whipping ability are less desirable than the gum type where it is desired to limit the overrun. Two methods for controlling overrun are: 1 Operate freezer with colder refrigerant and for longer time before refrigerant is shut off (i.e., shorter whipping time) 2 Select the proper stabilizer.

- Overrun, Determining the Amount of—**
- 1 Legal regulations enforced in the market area.
 - 2 Total solids content of the ice cream. Higher total solids may permit use of a higher overrun.
 - 3 Composite ice creams (such as fruit and nut) require a lower overrun than plain ice cream in order to obtain an equally desirable body and texture.
 - 4 Selling price of ice cream.
 - 5 Type of package. So-called "hulk" packages which are sold for "dipping" usually contain 90 to 100% overrun while packages of the carry home type usually are most satisfactory if they contain 70 to 80 per cent overrun.

Overrun, Per Cent of—See "Ice Cream and Other Frozen Desserts" by Frandsen & Nelson.

Packaging Ice Cream—

When the ice cream is drawn from the freezer it usually is collected in containers which give it the desired shape and are for convenient handling during the hardening and marketing processes. These containers are of two types—the multi-service package and the single-service package.

The multi-service package—Originally heavily tinned steel cans were used and even now these are practically the only type of multi-service package in use. They are cleaned sanitized and used repeatedly. This type of package has certain advantages such as:

- ✓ 1. There is greater ease in dipping out the ice cream from these heavy rigid cans than from the more flexible paper containers.
- ✓ 2. These cans are not easily damaged even when packed in ice and salt.
- ✓ 3. They are less expensive, particularly if abuse and loss of the cans are prevented. Normally these cans average about 27 trips per year and by retinning them every two years will last ordinarily about six years. Where conditions favor more trips and longer life of the cans (especially without retinning) the cost may be greatly reduced.
- ✓ 4. There is less danger of the ice cream shrinking during hardening and marketing.

The single-service type of package—Especially during recent years this type has met with increasing favor. The rapid improvement of roads, delivery trucks, and mechanically refrigerated cabinets, as well as the wide use of continuous freezers and automatic packaging machines, have hastened the increasing use of single-service containers. Also, the consumer's demands and purchasing habits have encouraged a definite change in favor of this type of package. In general, these packages are constructed of paper or cardboard which has been treated to make it impervious to moisture. The larger sizes have the minimum of very light-weight metal necessary to give correct shape to the package. As yet their use in special molds has been restricted to the simplest forms, such as replacing the metal 8 qt. brick pan or slab. Some advantages of the single-service type of package are:

- ✓ 1. Less space required for storing a given volume of ice cream.
- ✓ 2. Less time required to harden a given volume of ice cream in the hardening room.
3. Elimination of the time, labor, and materials used to salvage, recondition, and properly clean the container, not only for regular customers but especially for the occasional orders like picnic gatherings.
- ✓ 4. Less rapid deterioration of delivery trucks and dispensing cabinets, because these cans are lighter in weight and have no sharp edges.
- ✓ 5. Less wear and tear on shipping bags.
- ✓ 6. Usually neater and cleaner in appearance.

- ✓ 7. Less danger of injuring the flavor of the ice cream.

The bulk package—so called, has always been used in selling the hardened ice cream to retailers who repackaged it by dipping it into servings such as cones or into small containers generally of a quart or less. Either single-service or multi-service containers may be used for bulk packages. When metal containers were widely used, these bulk packages included sizes of one, two, three and five gallons. During recent years, along with the advent of the single-service type of package, there has been a tendency to standardize on bulk packages of only the two-and-a-half gallon and five gallon capacity, the one-gallon size being listed among the "carry-out" packages. The bulk packages are always factory-filled, usually directly from the freezer—(freezer-filled) or sometimes from a hopper which collects the ice cream from the freezer. The hopper is insulated or refrigerated and is generally installed so that a number of hatch freezers can be emptied into it without interrupting the freezer-emptying process, and so that the ice cream can flow by gravity to a lower level where it is packaged. The advantages are about the same as those for package-filling machines. The necessity for speed in emptying the batch freezer (in order to avoid variations in overrun) makes it undesirable to freezer-fill packages of less than two-and-a-half gallon capacity. When filling bulk packages many manufacturers use ice cream having 90 to 100% overrun, which is slightly higher than for ice cream placed in "carry-out" packages.

The "carry-out" or "take home" package—This package represents the most important development in the packaging of ice cream. This change has paralleled the adoption of the continuous freezer, the automatic packaging machine, and the development of the single-service type of package, as well as the emphasis by the consumer on the "ready packaging of all food products." The carry-out package for ice cream has practically always been the single-service type and made of paper or cardboard in sizes of one quart or less. When packages of such sizes are filled directly from the batch freezer, consecutive packages will contain ice cream having widely different overruns. A possible exception to this is the brick ice cream that is molded in 8-qt. slabs and then cut into individual bricks which are wrapped and cartoned by hand.

The dipped package—This usually refers to carry-out packages filled by the retailer who dips the hardened ice cream from a bulk package in his cabinet and presses it into the new container. This type of package has few advantages and many disadvantages.

Packaging Machines, (Ice Cream)—Packaging machines or fillers are used to fill the small carry-out packages. These machines are either insulated or refrigerated and are so constructed that contents of the freezer can be emptied into them quickly. There is only gentle agitation of the ice cream in these machines which prevents wide variation of overrun in the packages.

Some advantages of the factory filled carry-out package are:

- 1 Greater convenience in handling
- 2 Retailing at much lower temperature thus reaching consumer in better condition
- 3 Less danger of the retailer damaging the quality of the product
- 4 Less chance of bacteriological contamination especially during retailing
- 5 Less variation in quantity as well as quality from one package to another
- 6 Faster and more convenient serving of customers
- 7 Less difficulty in estimating profits and keeping records
- 8 Neater appearance of package

The ice cream put into the factory filled carry-out package should usually have a lower overrun than the same product put into bulk packages. The difference in overrun is commonly from 15 to 20% and partially compensates for the greater weight obtained when the retailer "dips" a similar package from the retail cabinet.

Parfait—Ice cream made from the regular mix with the addition of eggs usually egg yolks. The amount of egg yolk used is great enough to give the product a distinctly yellow color.

Parti-Cake—A whipped cream decorated cake of ice cream. Flat cylindrical form with fluted inner liner and of variable size.

Parry Sundae—A cup of ice cream with fruit syrup topping.

Perpetual Inventory—Continuous record of all frozen dairy products, ingredients and stock both going in and out of the hardening and stock rooms.

Philadelphia Ice Cream—Ice cream which is

made of cream sugar flavoring, and usually a stabilizer. Under this heading the following would be included: Plain ice cream, nut ice cream, fruit ice cream, chocolate ice cream, coffee ice cream, macaroon ice cream, etc.

Pickaninny Freeze—The registered trade name of a product which consists of raspberry-red colored ice cream in the form of a slice of watermelon. Drops of milk chocolate hardened to resemble ripe seeds are usually added through the fruit funnel and so frozen into the ice cream. The slices are molded in forms.

Popsicle—A water ice frozen without overrun. Contains sugar stabilizer, citric acid, flavoring and water. A registered trademark of the Joe Lowe Corporation for a quite scintillating frozen confection having two sticks.

Powdered Ice Cream Mix, (Ice Cream Powder)—All ingredients of the mix have been combined and concentrated to powder form so that only the addition of water and then freezing are required to make the ice cream. It was originally dried for easy shipment to the armed forces in all parts of the world. Several brands are on the market.

Pudding—A high fat ice cream with eggs, nuts and fruits highly flavored or seasoned. Nesselrode, Plum, Manhattan and Oriental are the common puddings.

Punch—In ice cream classification an ice flavored with alcoholic liquors or with highly flavored fruit juice or spices and served in a semi-liquid consistency. Also a liquid beverage containing a variety of fruit juices and sugar.

Py Sicle—A registered trade mark of the Joe Lowe Corporation for a chocolate coated ice cream frozen confection on a stick.

Rainbow Ice Cream—An ice cream made by gently mixing 6 or 8 different colored ice creams as drawn from the freezer in such a manner as to produce an attractive marbled appearance.

Recontamination Problem—This problem is very complex because (1) the product is exposed to so much equipment some of which is difficult to sanitize and (2) the product is exposed to human contact. Hygienic ingredients can be reasonably assured by obtaining bacterial counts on all products used in the ice cream. Bacterial counts and coliform tests on samples of ice cream taken at various places between the pasteurizer and the retailer aid in discovering

recontamination. Wherever possible human contact should be eliminated, and where it cannot be avoided the health of the worker should be supervised and he should be compelled to practice hygienic habits.

Refresho—A registered trade-mark of the Joe Lowe Corporation for a chocolate coated frozen confection on a stick consisting of either (1) ice cream (2) ice milk or (3) vegetable fat frozen dessert.

Refrigerants Commonly Used in the Ice Cream Industry—Of the many and various refrigerants, only two have been found sufficiently satisfactory to be widely used in the ice cream industry: *Ammonia*, which has been used a long time, and *Freon-12*, a representative of the non-toxic refrigerants used in ice cream cabinets, in small installations (home refrigerators, counter freezers, etc.), and where very low temperatures are not required.

The most important advantages of *ammonia* are: (1) It absorbs a large amount of heat when vaporizing (2) operating pressures are reasonably convenient, (3) leaks are easily detected, (4) its toxicity is not great though its odor is very pungent, and it has a very pronounced irritating effect on mucous membranes and wet skin, and (5) it usually operates at pressures above atmospheric, thereby keeping foreign gases and liquids out of the system.

Freon-12 is one of the many Freon refrigerants. The advantages of these refrigerants are: (1) they require lower operating pressures, (2) their odor is neither objectionable or toxic, (3) they are not injurious to food materials, (4) they are not corrosive to usual metals, although alloys containing magnesium must be avoided, (5) smaller and more compact refrigeration systems can be used because of the lower pressures and the use of copper alloys (hermetically sealed units are very popular), (6) they are carriers for oil thus facilitating the lubrication of compressors, (7) mechanical automatic operation is fairly simple, and (8) more uniform temperatures can be maintained.

Re-run, Ice Cream—Soft ice cream left over at various plant operations such as when filling packages, pints, novelty molds, making rolls and bricks, or left-over hard ice cream from hardening room operations—cutting bricks, making rolls—damaged packages from delivery trucks. Soft ice cream collected from sanitary lines in the factory and storage tanks may be returned to the freezers to be re-run.

Revel—A registered trade-mark of the Joe Lowe Corporation for variegated ice cream.

Salt, Use in Ice Cream Making—Although not a spice, salt is often used in very small quantities to enhance the flavor of ice creams, especially in mixes containing eggs—custards and rich puddings—and in nut ice cream.

SALES OUTLETS

In recent years, as competition for ice cream business has become keen, the wise ice cream manufacturer, as a security measure, tries to assure himself of a dependable market for his product. There are several types of market from which he may choose. He may wholesale to stores, retail directly from his factory to his customers or have his own special outlets such as dairy bars, drive-in stores, etc.

Factory retailing has been somewhat facilitated in recent years by the availability, in most commercial centers, of dry ice, and by use of single service containers and light cardboard packing cases.

Drive-in Store—The main requirement for the drive-in store, second only to the store itself, is plenty of parking space for customer's cars. If possible the site chosen should have a pleasing background and a good view, and the parking area should be kept neat and tidy. Since it has been estimated that about 75% of ice cream business is in repeat orders, obviously the drive-in store should be on the edge of the residential area and preferably near and in view of a well-travelled highway. The store itself should be attractive, well-lighted, well-arranged and convenient for service. It should be kept clean and sanitary in every detail, even to toilets for the public and for employees.

The manager of such a store, of any food store, should make it a first rule to become familiar with his state and local community health regulations and insist that all his employees and persons delivering food products to his establishment comply with such regulations.

Soda Fountain Suggestions—

General Housekeeping. Both the inside and the outside of the fountain need regular attention both as to cleaning and upkeep. For sanitary reasons, the inside must be kept scrupulously clean. Keeping it clean both inside and outside also retards corrosion of the metal linings and thus prolongs the life of the fountain. Keep in mind too that a general spiciness appearance has definite customer appeal and generally pays off handsomely in additional profits.

Glass or Paper Dishes At the fountain either glass or paper cups and serving dishes may be used. Many people prefer glass service ware but if it is used great care must be taken to prevent breakage and to keep dishes sanitary. With glass there is also the danger that chips of glass may fall into the open ice cream cans, and there is always the extra work of cleaning dirty dishes. When paper cups and dishes are used, good house keeping is made easier, the serving can be more sanitary and there is no danger of broken glass and no expensive delay for dishwashing.

How to dip ice cream While it may seem like an easy thing to do it really takes practice and planning to dip ice cream properly. To lower the ice cream surface evenly in the can to cut from the highest surface of the ice cream, and to keep the can stationary while dipping the ice cream for the cone requires skill that comes only with practice. Experienced fountain operators have found that it is best to press the ball of ice cream gently on the side of the cone with out side of the dipperbowl, pressing just enough to make it stick but not enough to spoil its shape or to break the cone. The dispenser should learn early at what temperature ice cream will dip or cut easily and still not be so soft as to spoil the texture and cause shrinkage. He will get this "feel" for dipping only by practice.

Personnel—Remember that soda fountain success is quite definitely dependent upon the selection and training of just the right type of personnel for giving good service. This applies equally well to dairy bar or dairy store personnel. The men and women behind the counter should be schooled to follow a well-planned routine regarding the best form of greeting and approach to customers in taking the order, in serving the food, in making suggestions for increasing the order, in presenting the customer's bill or check, and in cleaning the counter before the next customer is served etc. In short, the good dispenser, or sales person, will cultivate cheerfulness meet customers with a smile, be dignified and quiet, give quick, accurate and gracious service, and be dependable and honest.

Training for Fountain Service—Quite likely the retailer's principal interest in the soda fountain is to increase his profits. To do this he must have more and more customers. In order to attract customers and have them come back for repeat orders, he must

be sure that his ice cream is of high quality, that good cream and good flavoring substances are used in making it, and that equally good quality of syrups and toppings are used to combine with the ice cream at the fountain. Generally it is best to buy and use only the best and most palatable materials for toppings and syrups and then be familiar with the "how" and "when" to use them effectively. Therefore it would pay the retailer to train his workers so they will sell more ice cream and thereby make larger profits.

Employees as Sales Representatives The men and women employed for fountain service are the principal contact the retailer has with the public who buy his products. It is really a waste of money to advertise, build and equip a fine building and manufacture or buy high quality ice cream if the employees who represent the establishment are sloppy, or lazy or if in general they create an unfavorable impression on the public—the consumer who is counted upon to buy this delicious product.

All that has been said about employees' training ability, and qualifications has been said simply to emphasize the fact that these employees really reflect the business and managerial ability of the proprietor. If he is a good manager his business will prosper. In case the business is larger than he can handle personally, much will depend on the store or fountain manager he chooses to help run the business for him.

Choosing a Manager The manager should be chosen with great care—not on the spur of the moment. His references should be carefully checked to make sure that he is all he represents himself to be. As a guide to checking his qualifications the following suggestions may be helpful: he must be honest, be conscientious, be able to handle personnel to work with them and yet be their leader; he must be efficient to the duties he is hired to perform and have some administrative ability; he must have enough originality to be able to develop new sales ideas and finally he must be 100 per cent loyal to the proprietor or organization which hires him. When the person with the right qualification has been found, he should be paid what he is worth, his boss should back him up to the nth degree and see that life is made pleasant for him especially until he is thoroughly initiated into his new job.

If the staff of store and fountain is to "click" as would be expected in a well in-

tegrated organization, training for the job is necessary for all employees. The work expected of them should be carefully explained, better still, ably demonstrated to them. Employees should be given a chance to ask questions and these questions should be very patiently answered so that the employee will thoroughly understand his work and that of the others with whom he must work.

The management which has thus thoroughly trained its representatives, i.e., its employees, for their respective jobs, should be well on the way toward a profitable business.

"Specials" For Special Occasions, Season Minded—One of the best ways of promoting sales is by featuring "specials" and being "season-minded" about them. Some especially appetizing and attractive reminders of Spring when Winter is about to take leave and equally attractive features for the other seasons will tempt the public to choose ice cream more often. There are many special days in every season which will suggest to the imaginative ice cream maker or soda fountain dispenser new ideas for taste-tempting formulas and decorative schemes. The variety thus introduced will make his product so attractive that sales are bound to mount. He must, of course, not only make these specials but see to it that they are well advertised so the public will know about them well in advance of the special day that is featured. For instance consumers should know well in advance of Easter what attractive special ice creams they may have for dessert and for decorating effects for that special day. So, with Fourth of July, World Series days, Thanksgiving, Christmas Day, New Year's and Valentine's Day to name only a few. Then there are birthday specials and anniversary specials to fit the season in which such family or club events occur. All these should be very good sales outlets for the manufacturer who is looking for extra business.

End of Sales Outlets.

Serum Solids—This term refers to the solids of skim milk used in ice cream making. They include a small amount of fat, proteins, milk sugar and the mineral matter. They are high in food value and they also help to improve the body and texture and viscosity of the ice cream.

Formula for Calculating the Per Cent to Use In an Ice Cream Mix.

$$100 - X$$

Factor = % serum solids to use under conditions for which the Factor applies.

In the equation:

$$100 = \text{total mix}$$

$$X = (\text{the sum of the percentages of all solids except serum solids.})$$

Factor = pounds of water used per pound of serum solids plus 1 lb. S.S. The factor that can safely be used to prevent sandiness in ice cream is $6.4 \text{ lb. H}_2\text{O} + 1 \text{ lb. S.S.} = 7.4$ (factor).

Sherbet Base or Stock Mix—

1. Between 21 and 25 lb. of sucrose (cane or beet sugar) the same as for an ice.
2. Between 7 and 9 lb. of glucose, invert sugar, or corn sugar, the same as for an ice and for similar reasons.
3. Between 0.4 and 0.6 lb. of stabilizer, the same stabilizer as used in ices and for the same reasons.
4. At least 35 to 40 lb. of milk—or enough to supply 5 or 6 lb. of total milk solids.
5. Enough water to make a total of 80 lb. of base or stock mix.

Sherbets, Difficulties and Defects of—

1. **Control of Overrun:** The percentage of overrun should be kept between 25 and 30% for ices and between 35 and 45% for sherbets. This is not easy to do, especially if gelatin is used as the stabilizer, without modifying the ordinary routine of freezing. Agar, gums or commercial stabilizers for ices are recommended largely because they retard the rate of whipping.
2. **Bleeding:** A term used to denote the settling out of the unfrozen portion of the sugar from sherbets and ices. The usual causes are excessive overrun, insufficient stabilizer, too much sugar (over 32%), too high temperature in the cabinet.
3. **Surface crust:** This sometimes forms on ices and sherbets and is due to surface evaporation of moisture and can be prevented by covering with parchment paper and can cover. If about one-fourth of the sugar is corn sugar, a surface crust will not occur. With cane sugar alone as the sweetener, this trouble more often occurs.

Sherbicle—A trade name for a frozen ice confection on a stick. It is similar to a Pop-sicle.

Cherry Blossom

1½ oz Cherry Syrup
1 soda spoon of Ice Cream or Whipped Cream or 1½ oz. Coffee Cream

Small amount of Crushed Cherries to side of glass

Carbonated water ¾ths full

2 #24 dippers Vanilla or Cherry Ice Cream

Carbonated water to fill if needed

Garnish with whipped cream

Chocolate Malted

1½ oz Chocolate Syrup

½ soda spoon malted milk powder

1 spoon Whipped Cream or Ice Cream or 1½ oz Coffee Cream

Carbonated water ¾ths full

2 #24 dippers of either Vanilla or Chocolate Ice Cream

Carbonated water to fill if needed.

Garnish with whipped cream

Frosted Root Beer or Black Cow

1½ oz Root Beer Syrup

1 soda spoon Ice Cream or Whipped Cream or 1½ oz Coffee Cream

Carbonated water ¾ths full

2 #24 dippers Vanilla Ice Cream

Carbonated water to fill if needed

Garnish with whipped cream

Strawberry Frosted

1½ oz Strawberry syrup (or crushed Strawberries)

1 soda spoon Ice Cream or Whipped Cream or 1½ oz. Coffee Cream

Carbonated water ¾ths full

1 #24 dipper Strawberry Fruit Ice or Sherbet

1 #24 dipper Strawberry Ice Cream or Vanilla Ice Cream

Carbonated water to fill if needed.

Garnish with whipped cream

TOPPINGS

Bittersweet Chocolate Topping

3 lb Glucose

1 lb Cocoa

1 Gal. Condensed Milk

Cook to good boil and when off fire add 5 lb marshmallow or nougat cream.

Ritzzy Rich Chocolate Topping

1¼ lb Mild Bittersweet Cocoa

5 pints Milk

6 lb Sugar

¼ teaspoon Salt

Mix cocoa and sugar together dry Put salt in milk and bring to boiling point Gradually work in the cocoa-sugar mixture Bring to boiling point stirring constantly and boil about two minutes Turn off heat strain put in covered container and cool rapidly

Swiss Chocolate Topping

2 lbs XXXX Confectioner's Sugar

(powdered sugar)

6 oz. Van Houten or Rona Cocoa

1 pint Coffee Cream

Roll the powdered sugar and cocoa on a flat surface preferably a cutting board covered with wax paper, until all the lumps in the sugar have disappeared Add to this 1 pint regular coffee cream Whip with egg whipper until perfectly smooth Add ½ teaspoon vanilla extract and whip again

Orange Pineapple Topping

Blend equal portions orange marmalade and simple syrup Add 1 part prepared orange marmalade to 2 parts crushed pineapple topping or canned crushed pineapple

Fudge Mallow

Fudge Mallow is made by blending together two portions of Chocolate fudge topping to one portion Marshmallow Creme Place in the fudge warmer and serve hot

Maple Mallow

To 1 qt of Marshmallow Creme, add ¼ oz. good quality Maple Extract, whip the flavor thoroughly into the marshmallow

Raspberry Mallow

1 pt Crushed Black Raspberries

1 qt Marshmallow Creme

Beat until well blended stir well before use

SYRUPS

Simple Syrup (30° Baumé)

5.8 pounds sugar

75 oz. (4.7 lb) water

Heat to dissolve Do not boil

Makes 1 gallon syrup

Simple Syrup—Practical Recipe for

10 Gallons

65 pounds sugar

35 pounds water

Dilute with water to Baumé degree desired

Chocolate Syrup (heavy)

2 lb. high quality Cocoa
12 lb. Sugar
½ gal. Milk
½ gal. Water
1 level teaspoon Salt

Mix cocoa and sugar together dry. Put salt in water, add the milk, and bring to boiling point. Gradually work in the cocoa-sugar mixture and bring back to boiling point, stirring constantly. Turn off the heat, whip smooth, add 1 ounce vanilla extract, strain, put in covered container and cool rapidly.

Recipe for 32° Baumé Syrup

6.25 pounds sugar
4.3 pounds water.

Almond Syrup

Into a gallon of simple syrup put 2 ounces of almond extract. Stir thoroughly.

Bittersweet Chocolate Syrup

1½ lb. Cocoa
2 qt. Water
5 lb. Sugar
½ tsp. Salt

Mix cocoa and sugar together dry. Put salt in water and bring to boiling point. Add cocoa-sugar mixture and again bring to boiling point. Turn off heat, whip smooth, strain, pour into covered container and chill rapidly.

Raspberry Syrup

3 oz. Raspberry Extract
2 oz. Citric Acid Solution (50%)
½ oz. Red Color, liquid
1 gallon Simple Syrup 32°

Root Beer Syrup (Creamy)

4 oz. No. 9 or No. 11 Root Beer Flavor
¼ ounce Citric Acid Solution (50%)
1 gallon Simple Syrup 32°

Coffee Syrup

5 qt. Water
1½ lb. Coffee
Pinch of Salt
10 lb. Sugar (white and brown half and half)

Have coffee ground fine. Place coffee in a drip funnel. Bring water to a boil—pour over coffee and let seep through. Add sugar and salt while coffee extract is warm. Will finish about 7 qt.

Lemon Syrup

1 ounce Lemon Extract
2½ oz. Citric Acid Solution (50%)
¼ oz. Yellow Color, liquid
1 gallon Simple Syrup 32°

Orange Syrup

1 ounce Orange Extract
2 oz. Citric Acid Solution (50%)
¼ oz. Orange Color, liquid
1 gallon Simple Syrup 32°

Pineapple Syrup

3 ounces Pineapple Extract
2 oz. Citric Acid Solution (50%)
¼ oz. Yellow Color, liquid
1 gallon Simple Syrup 32°

SODA FOUNTAIN TERMS

Following are a few of the most commonly used Soda Fountain Terms:

Ade—Drinks containing the juice of citrus fruits, sweetened, to which plain or carbonated water is added.

Baume Hydrometer—Used to determine the degree of sugar concentration in simple syrup.

Bon-Bon—Similar to a sundae. Usually made in a 6 or 7 ounce fancy stem glass. Candied fruit in the bottom of glass, a combination of Ice Cream, Sherbet, flavor or fruit.

College Ice—This name was given to a sundae in a college town and was originally applied to sundaes topped with whipped cream.

Cooler—A drink made of fruit or fruit flavors in combination with ice, carbonated or plain water and topped with sherbets. Frequently made up complete and dispensed from punch bowl.

Double Sundae—The same flavor Ice Cream and same flavor topping—as for example Chocolate Ice Cream and Chocolate topping.

Egg Phosphate—A glass of carbonated water in which has been scientifically blended flavor, acid phosphate and an egg.

Fizz—Originally applied to tart drinks to which were added powdered sugar to give the fizzing effect. This name is applied to many egg drinks.

Float—An ade, freeze, ricky, milk shake or other drink on the top of which fruit ice, sherbet or Ice Cream is floated.

Frappé—Frozen or partly frozen fruit juices. It is applied to whipped combinations of Ice Cream—syrup—fruits—nuts and whipped cream.

Sherbo—A registered trade mark of the Joe Lowe Corporation for a chocolate coated confection on a stick consisting of either (1) ice milk, (2) vegetable fat frozen dessert or (3) sherbet

Sidewalk Sundae—A 4 ounce chocolate coated frozen confection on a stick—the center 2 ounce portion of which is a chocolate or fruit and the outer 2 ounce portion is ice cream. A registered trade mark of the Joe Lowe Corporation

Simple Ice Cream Mixes—Simple mixes require the least calculation and include such mixes as one made of stabilizer, sugar and cream or one made from ingredients each of which supply only one constituent

SODA FOUNTAIN SPECIALS

American Beauty

(flat or footed round dish)

1 #10 dipper Vanilla Ice Cream

1 oz Chocolate Fudge

5 stem Whole Maraschino Cherries

Sprinkle chopped nuts over fudge. Garnish with a straight line of whipped cream through center and sprinkle chocolate decorations over all

Banana Whip

(stem sundae dish)

2 #20 dippers Chocolate Ice Cream

Sliced Banana—to cover

Top with a generous portion of whipped cream and a cherry

Bee Hive

(tulip glass)

½ oz. Pure Honey

2 #20 dippers Vanilla Ice Cream

1 oz. Pure Honey

Over the top sprinkle a portion of fresh crunchy roasted salted almonds. Garnish with whipped cream and a red cherry

Birthday

(tulip glass) (for February 12)

½ oz. Log Cabin or Maple Syrup

2 #20 dippers Chocolate Ice Cream

1 oz. Log Cabin Syrup

Two pretzel sticks on each side of dish to form a sundae. Top with cherry

Black Cherry Sundae

(tulip glass)

½ oz Burgundy Cherries

2 #20 dippers Vanilla Ice Cream

1 oz. Burgundy Cherries (over ice cream)

Decorate with whipped cream

Blueberry Banana

(tulip glass)

½ oz. Fresh Blueberries

2 #20 dippers Vanilla Ice Cream

1 oz Fresh Blueberries

Decorate with whipped cream and sliced banana around edge of glass. Top with a whole blueberry

Brandi Peach

(stem glass or paper service)

1 #12 dipper Vanilla Ice Cream

1 oz Brandi Peach

Border of whipped cream around edge of dish. Place a date on each side and English walnut halves between each date. Place a whole cherry in center

Butterscotch Peanut Royal

(ice cream bowl or round dish)

Slices of Banana (to cover bottom of dish)

2 #20 dippers Butterscotch vanilla Ice Cream

1¼ oz. Butterscotch (between molds)

Top with blanched salted peanuts

Caramel Crunch

(crimp or tulip glass)

½ oz Caramel Topping

2 #20 dippers Vanilla Ice Cream

1 oz Caramel Topping

Grape Nuts or Chopped Nuts

Top with a cherry

Chocolate Peanut

(tulip glass)

½ oz of Marshmallow Topping

1 #20 dipper Chocolate Ice Cream

1 #20 dipper Vanilla Ice Cream

1 oz. Chocolate Topping

1 spoon Salted Peanuts over topping

Chocolate Rice Krispies

(tulip glass)

½ oz. Chocolate Topping

2 #20 dippers Vanilla Ice Cream

1 oz. Chocolate Topping and a good portion of Rice Krispies.

Garnish with a cherry and whipped cream

Christmas Fountain Special

(tulip glass)

2 #20 dippers Chocolate Ice Cream

Small portion of Special Christmas

whipped cream dressing

Garnish with whipped cream and red and green cherries or red and green pineapple cubes

Frosted Chocolate—Another name for a chocolate milk shake made with Ice Cream

Frosty—A milk shake made with sherbet or fruit ice

Glacé—Frozen or iced fruits nuts etc Drinks with an overlay of fruits or nuts usually made very cold with ice Also applied to sundaes on which glossy surfaced fruits and sugared nuts are served

Ice Cream Soda—A combination of fruit syrup or other flavor Ice Cream and carbonated water

Royal—Applied to unusual Ice Cream combinations—generally those in which sliced fruit covers the bottom of the dish and is topped with Ice Cream fruits toppings nuts etc.

Shakes—Originally applied to any drink that was shaken to mix it. Now applied to milk drinks made with Ice Cream and mixed on drink mixer

Soda—Usually accepted at the Soda Fountain to mean Ice Cream Soda

Sundae—A portion of Ice Cream over which one or more dressings of syrups fruits nuts or other toppings are poured

Twin Sundae—A two-in-one method of making a sundae Two molds of Ice Cream alongside one another in the same dish and topped with the usual sundae materials

End Soda Fountain Specials

"Soft" Ice Cream—See Ice Cream Formulas

Sogo Ice Cream—A sorghum flavored ice cream developed at the University of Tennessee The flavor is produced by the addition of 1 lb of especially prepared sorghum syrup to 5 gals of regular ice cream mix in the freezer A flavor similar to caramel and butterscotch is produced

Sorbet—A superior sherbet of fine texture. It is made by scalding the milk and adding whipped egg whites.

Soufflé—An ice made from water eggs sugar and flavoring material It differs from a sherbet mainly in that it contains the whole egg instead of just the egg white Also a soufflé is usually frozen with a high overrun to obtain a fluffy product

Spices—Cinnamon cloves nutmeg, allspice and ginger are used to a limited extent as

flavorings in ice cream sherbets and ices Ginger ice cream is a favorite in some localities Cinnamon nutmeg or cloves are often used to enhance or vary the flavor of chocolate ice cream and they are used in combination with fruits or fruit extracts in such frozen products as puddings eggnog and punch They may be purchased either in dried and finely ground form or as extracts Their flavors are very pungent and therefore only small amounts are required to produce the desired flavoring effect.

Spumoni—A fancy ice cream made in cup-shaped form The outside is usually vanilla ice cream and the inside is usually chocolate mousse and tutti frutti mousse It is served in wedge-shaped portions

Stixie—A registered trademark of the Joe Lowe Corporation for a frozen confection on a stick consisting of sherbet and water ice in contrasting colors one being an inner core and the other being an outer coating

Storage, (Ice Cream)—Hardened Ice Cream may be immediately marketed or it may be stored for a limited time without too much deterioration in quality

Sucrose—Commonly known by such trade names as granulated sugar cane sugar and beet sugar ($C_{12}H_{22}O_{11}$) is the most widely accepted source of sweetening

Sultana Roll—An ice cream product made in a round mold The center of the roll consists of tutti frutti ice cream and the outside of pistachio mousse

Swell—See Overrun in ice cream

Test for Flavor and Aroma—In the manufacture of ice cream this is perhaps the most essential routine test It is one of the best and most accurate measures of quality The aroma (or odor) is best observed in a place where there are no strong odors and when the observation is made immediately after the sample bottle is opened The flavor is obtained by taking a small portion (about a teaspoonful) into the mouth allowing it to warm and then carefully rolling it to the back of the mouth without swallowing any of it After the flavor has been observed the portion is delivered into a garbage receptacle instead of being swallowed. Then the next sample may be tested Care is necessary to avoid contaminating the product.

Texture—Refers to the grain or to the finer structure of the product, and depends upon the size, shape, and arrangement of the small particles. Ice Cream having an ideal texture will be very smooth, the solid particles being too small to be detected in the mouth.

Variigated Ice Cream—An ice cream through which has been distributed approximately 15-20% of a flavored syrup or a different flavored ice cream.

Vienna Ice Cream—Same as New York or Neapolitan ice cream, containing the yokes rather than the whole eggs.

Vitamin Content of Ice Cream—Like milk, ice cream is a rich source of many of the essential vitamins. For a complete list of vitamins and food values in ice cream see "Ice Creams and Other Frozen Desserts" by Grandsen & Nelson.

Water Ice—Fruit juice diluted with water to the proper degree, sweetened, and frozen in an ice cream freezer. It may contain a stabilizer, and added color and flavor, and fruit acid. Its texture is grainy like firm wet snow, quite different from the texture of ice cream.

Wet Pack Cabinet—An ice cream cabinet in which the can of ice cream is in direct contact with ice and salt.

Weight Control—Controlling the weight of finished ice cream by actually weighing the packaged ice cream and adjusting the freezers to get the desired overrun.

End of Ice Cream.

Iceless Cabinet—A cabinet in which ice cream is held at low temperatures. It is a small, complete refrigeration plant, usually of the compression type, connected to an insulated brine tank which surrounds the ice cream compartments. Cabinets vary in size and number of compartments. The machines are automatic in operation and are driven by an electric motor which is started and stopped by thermostat switches.

Ice Plow—A plow for cutting ice on rivers, ponds, etc., into cakes.

Iceing Machine—Automatic machine that deposits ice in milk cases. The ice is taken from the storage bin to the machine by a conveyor.

Icy Pellets, Icy Texture—See Ice Cream Defects.

Identification, (Tattoo, Number Tags, Branding, Ear Notches, Etc.)—A means of designating and identifying the animals in a herd (especially in purebred herds where a definite method of marking is used for identification). This is done by color markings or photographs, or color sketches of broken-colored animals and with a tattoo in the ear of solid colored breeds. Other methods are the ear tag, a number tag fastened around the neck or horns, branding numbers on horns or hips, ear notches or a nose print.

Ilha Cheese—See Cheese.

Itotycin, (Erythromycin)—See Antibiotics.

Inbibitioo—The taking up of a liquid by a gel. The process of absorption of liquid by a solid.

Imhoff Tank—A method for purification of sewage. Two storage tanks built so that the sewage passes through the upper section while the sediment passes to the lower section.

Imitation Evaporated Milk—See Milk and Cream, Processing and Processing Equipment.

Immobilization—The conversion of an element from inorganic to organic combination in microbial or plant tissues. This has the effect of rendering unavailable and usually not readily soluble an element that previously was directly available to plants.

Immune—Exempt from disease. A plant or animal may be resistant to a disease in varying degrees, but immunity implies 100% resistance.

Immunity—Resistance of a plant to a particular disease or condition, usually brought about by various methods of plant breeding. In animals—a condition in which the body becomes resistant to disease either through the use of vaccines and serums or through the antibodies produced in the body of an animal having had an attack of the disease.

Immunization—The act of rendering a crop, an animal, or man 100% resistant to attacks by specific organisms or pests generally established in an area.

Impaction of Rumen—See Diseases in Cattle.

Impotence—The loss of breeding power; incapacity for sexual intercourse, incapability of serving as a breeder. Many bulls as they become older are less certain as breeders. When they lose this power entirely, they are said to be impotent.

Impound—To lock up or shut up as to impound stray cattle or other valuables.

Impregnate—To make pregnant, to get with young; to fertilize, as regards animals or plants.

Improved Pasture—A pasture that has been renovated, fertilized, and reseeded to improve strains of pasture plants.

Improvement Association—An organization designed to aid farmers in producing better crops and livestock, such as crop-improvement, livestock breed and registry, pure-bred bull associations, or tonbitter clubs.

Improvement Project—An undertaking involving a complete unit of activities planned and executed to produce no immediate income but which will improve the real estate value of the farm, the efficiency of the farm business, or the living conditions of the farm family.

Improvers, Ice cream—See Ice Cream.

Inanition—Exhaustion from lack of food or non-assimilation state of fasting.

Inbreeding Coefficient—A measure of the increase in homozygosity (or reduction in heterozygosity) of an individual over the average homozygosity found in the population. It is equal to one-half the relationship between the parents of the individual unless the parents are themselves inbred. See Relationship.

Inbreeding in Animals—The mating of individuals more closely related than the average relationship found in the population, as brother-sister parent-offspring. Inbreeding tends to decrease heterozygosity, thereby reducing the genetic variability in the offspring. Rapid inbreeding tends to uncover deleterious recessive characters and reduce vigor, size or fertility. In plants this is obtained by self fertilization.

Incanestrato Cheese—See Cheese.

Incompatible—Not capable of being mixed, resulting in destructive chemical changes.

Incompatibility—The characteristic of being incompatible. In genetics, the inability of sex cells to unite and form a fertilized egg that can grow to maturity.

Inconel—A nickel based alloy containing a small amount of chromium and steel.

Incross—A cross between individuals of the same strain, also, the progeny of such a cross.

Incubation, Incubation Period—The growing of a culture of bacteria in an incubator to favor development of the organisms. In the case of infectious diseases, the time between the infection and the appearance of the first symptoms.

Incubator—A cabinet and apparatus for maintaining cultures of bacteria and other materials at a constant and suitable temperature.

Index Number—A number used to compare the value of an attribute, usually cost, with the value of the same attribute at some standard time, the value at the standard time being usually taken as 100. Thus if the cost of a certain commodity in 1940 was one and one-half as much as its cost in 1913 its index number, relative to 1913, was 150. For index number, the year 1913 was chosen because it is generally accepted as the year showing the most satisfactory balance between agricultural and industry prices.

Indian Corn—See Corn.

Indian Gum—Same as Gum Bassora. Also known as Karaya Gum.

Indican—A substance that occurs in perspiration and in varying amounts in urine; if in quantity, generally an indication of protein putrefaction. In certain disease conditions this substance is found in milk.

Indicator Plants—Plant associations that indicate physical conditions and overall fertility of a piece of land. The term generally refers to plant growth which indicates abused or overgrazed pasture land.

Indicators for Various Tests—See Indicators & Reagents Chapter 43 in Laboratory Manual Milk Industry Foundation.

Indicators used for Certain Bacteriological Tests—Substances used to show by a color or other change when a reaction has taken place or a chemical affinity has been satisfied. Some common indicators are: 1. Sulfonephthalein, 2. Brom thymol blue, 3. Brom cresol red, 4. Methyl red.

Indirect Oxydase—Same as Peroxidase.

Indolac—A trade name describing the yellow tablets used in the short, vest-pocket size modification of the phosphatase test. When dissolved in ethyl or methyl alcohol, it makes up the B. Q. C. or indicator solution.

Indole, Production by Bacteria—Some bacteria have the ability to split the tryptophane molecule resulting in the formation of indole. Such organisms are indole positive.

Indophax Solution—A reagent used in the Phosphatase Test for Cream, and Milk. See also B.Q.C.

Induction Period—The initial period in the oxidation of a fat during which the rate of oxygen absorption is slow, so that a considerable time elapses before there has been sufficient oxidation to show appreciable flavor deterioration. The induction period is the period in which antioxidants are depleted.

Induration—See Diseases in Cattle.

Inert Bacteria—A group of bacteria comprising those organisms which produce no visible change in litmus milk after growth for 14 days at their optimum temperature (86°F).

Inertia—That characteristic which causes a body to continue on its present state of rest or motion, unless acted on by some force.

Infantile Diarrhea—A serious intestinal disturbance in babies or children which may be caused by infected milk. It is responsible for a considerable number of infant deaths. Causative organisms may come from the excreta of the cow, and may be present in large numbers when hygienic conditions in the dairy are neglected, and especially when temperatures are high enough to encourage the growth of these intestinal types. It has been proved that clean milk, properly handled and pasteurized, does not produce this condition. Also known as Summer Complaint.

Infection—The entering into the tissue of the body of microorganisms of a pathogenic nature; could be systemic or through wound.

Infectious Abortion—See Diseases in Cattle.

Infectious Catarrhal Conjunctivitis—See Pink Eye. See Diseases in Cattle.

Infertility in Dairy Cattle—See Diseases in Dairy Cattle.

Infestation—An invasion of pests or parasites.

Infiltration—The downward entry of water or other liquid into a soil or other permeable substance.

Inflamed Udder—See Diseases in Cattle.

Inflorescence—In botany, a flowering branch with a single flower, or collection of flowers.

Infrared Rays—By means of sensitive heat-absorbing instruments (radiometer) it is known that the sun sends out not only the light waves which affect the optic nerve but also longer waves which though invisible can produce strong heating effects. These are called infrared rays. Infrared light has become very important, because with the use of a special photographic film and these long rays it is possible to take pictures through clouds, mists, and haze, and pictures can even be taken in total darkness.

Inheritance—The reception or acquisition of characters or qualities by transmission from parent to offspring.

Inhibitors—Certain chemical substances added to washing powders to lessen corrosion of metals during the cleaning process.

Inhibitory Substances—These substances which retard growth, sometimes gain access to the milk either through the cow or by additions to the milk. Among these are sulfur drugs, chlorine, quaternary compounds and antibiotics.

Injector—A device used for feeding boilers and for raising liquids from one elevation to another.

Inoculation—The introduction of minute organisms as bacteria or of serum or the like into the tissues of living plants and animals milk culture media etc. Seed or Soil is inoculated by the introduction of nitrogen fixing bacteria into the seed of legumes or into the soil in which legume seed has been planted Leguminous plants play host to these bacteria and aid them in fixing large quantities of atmospheric nitrogen as in root nodules of legumes

Inorganic—Matter not living as rocks or sand as contrasted with organic or living matter

Inositol—See Vitamins

In Place Cleaning of Pipelines (CIP)—See Articles in Handbook P 18, 201

Insect—Commonly a small invertebrate animal having the body more or less segmented They have at least six legs some times more and usually bear wings al though some are wingless as spiders centipedes etc It is estimated there are 10 000 000 species of which 47 000 are known to science More specifically that group of arthropods having six legs and frequently wings See Fly Breeding Places and Fly Poisons See "Insects and Their Control" in Handbook P 253

Insecticide—An agent or preparation for destroying insects as an insect powder or liquid spray

Inseminate—To implant the male sperm in the ovum To breed an animal either naturally or artificially

Inseminating Association or Unit—A unit of an artificial breeders association composed of a number of dairymen within a limited area for the purpose of having their cows bred artificially The unit hires an inseminator who breeds the cows with the semen from bulls owned by the parent organization or otherwise made available to it

Inseminating the Cow—The act of placing the semen from a bull in the uterus or in the folds of the cervix of the cow Also called artificial breeding

Insemination—The deposition of semen in the female reproductive organs during coitus or breeding In some species the semen is deposited in the cervix or uterus

Inseminator—The welltrained skilled tech

nician who is qualified to perform all the duties involved in artificial insemination such as collecting semen preserving it and extending it under favorable conditions until used inseminating the cow or other animal and collecting and keeping complete details of the work

Inspection of Dairy Farms—See Requirements For The Sanitary Production of Sweet Cream and Milk For Manufacturing in Handbook P 60

Insulated Packers—See Ice Cream

Insulation—The separation of a body from other heat conducting bodies by the use of materials that do not conduct heat As applied to the construction of cold storage rooms the insulation materials commonly used in walls floors and ceilings to prevent the passage of heat through them are ground cork felt sawdust asbestos aluminum foil aerated rubber and glass fiber Dead air space between walls also provides some measure of insulation

Insulators—Materials which have high resistance to the passage of electricity

Intercalary Supernumeraries—Supernumerary teats that are found between the normal teats of a cow

Interfacial Tension—The resistance of a surface film of liquid to rupture It is a type of tension represented by liquid to liquid or by solid to liquid interfaces The surface tension at the boundary between two immiscible liquids or between a liquid and a solid This tension increases as the temperature decreases

Internal-combustion Engine—Any engine in which the working medium consists of the products of combustion of the air and fuel supplied

Internal Conduction—The transfer of heat within a body from one particle to another

Internal Latent Heat—The amount of heat required to convert water at its boiling point into steam 970.4 Btu are required to convert 1 lb of water at 212°F into steam of the same temperature

Internal Phase—The substance which in a colloid system is the sub-divided or dispersed phase

Internal Tubular Cooler—See Milk Processing and Processing Equipment

Intercool Tubular Heater—See Milk, Processing and Processing Equipment.

International Unit (I.U.)—A unit as defined by the International Conference for Unification of Formulas for biologically active material and patent medications.

International, (World) Dairy Congress—An international organization, interested in dairy problems, that meets generally every two or three years. Information can be secured from the Secretary of Agriculture, U.S.D.A., Washington, D. C.

Interode—Portion of the stem between nodes.

Intoxation—Poisoning, especially by the toxic products of bacteria or poisonous animals, other than alcohol.

Intoxication—A form of intestinal toxication (poisoning) by bacteria. Antibiotics and the drinking of lactic acid cultures have proven beneficial. State of being drunk or poisoned by spirituous liquor as alcohol or by narcotic drugs.

Intracellular Enzyme—An enzyme contained within a living cell. See Endoenzyme.

Intradermic Test—A method of applying the tuberculin test to dairy cattle. This test is used to a considerable extent because of its convenience and, when made by a skilled person, is very accurate. A few drops of tuberculin are injected between the layers of the skin, usually in the region at the base of the tail. An animal with tuberculosis will show a varied amount of swelling at the point of injection 72 to 120 hours after the injection has been made.

Invertases—Enzymes which convert complex sugars into glucose. See Sucrase, Maltase and Lactase.

Invertebrate—Without a backbone or spinal column.

Inverting the Curd—See Cheese.

Involution—The change of the uterus back to normal after parturition.

Iodinated Casein—This product is an iodinated protein prepared under carefully controlled conditions, which has the same effect on milk production as thyroxine (a hormone secreted by the thyroid gland which has a stimulating effect upon metabolism and milk secretion). Also known as "thyroprotein" and "protamooe."

Iodine—An inorganic element required by animals in small amounts for normal thyroid function. Frequently deficient in the soil and water of certain inland areas. Iodized salt is often used as a supplement for livestock and man.

Iodine Number—A measure of the extent of unsaturation of a fat or oil. It is the amount of halogen, calculated as grams of iodine, that will be absorbed by 100 grams of a fat or oil. The iodine number of milk fat varies from 25 to 45 and depends largely on the feed received by the cow. See Wijs and Hanus Methods.

Ion—An electrically charged atom or group of atoms in solution or in a gas. Solutions always contain equivalent numbers of positive and negative ions. An electrified particle formed when a neutral atom or group of atoms loses or gains one or more electrons. Acids, bases and salts, when dissolved in certain solvents are more or less dissociated into electrically charged units, called ions.

Ion Exchange Treatment—Treatment to alter the ionic composition of a solution by placing it in contact with an insoluble substance (the exchanger) which is capable of combining with either anions (the negatively charged particles or ions) or cations (positively charged ions). Naturally occurring minerals were formerly used as exchangers but have been largely replaced by organic resins specifically designed for the purpose. The ionic composition of milk can be varied within wide limits by such treatments.

Iowa Swiss—See Cheese.

Irish Potato—The ordinary white potato, so called only because it is a favorite article of food in Ireland.

Iron, (Fe)—A very useful malleable, ductile, rather soft metal of great importance in industry but has not been found suitable for use in dairy equipment. It has several disadvantages, among which are the facts that through the process of oxidation it can impart a tallowy flavor to milk, it rusts easily, and it has a low heat conductivity. One of the essential elements in the soil having to do with the formation of chlorophyll. Lack of iron causes a yellowing or chlorotic condition in leaves. A trace element in milk.

Iron Bowl Separator—See Eiserner Trommel.

Irradiated Milk—See Milk and Cream.

Irradiated Yeast—See Feeds and Feeding

Irradiation—As applied to milk—the process of exposing milk to ultra violet rays

Irrigated Pastures—Pastures receiving some form of supplemental water through irrigation prior to duning, or after the grazing season

Irrigation—The artificial watering of farm land by canals, ditches, flooding, overhead irrigating etc. to supply growing crops with moisture

Irrigation Efficiency—The ratio of the water consumed by crops of an irrigated farm or project to the water diverted from a river or other natural water source into the farm or project canals

Irrigation Methods—

Border strip—Water applied at the upper end of a strip with earth borders to confine the water to the strip

Check (bassin)—Water applied rapidly to relatively level plots surrounded by levees. The basin is a small check.

Corrugation—Water applied in small closely placed furrows frequently in grain and forage crops to confine the flow of irrigation water to one direction

Flooding—Water released from field ditches and allowed to flood over the land.

Furrow—Water applied in small ditches made by cultivation implements for tree and row crops

Sprinkler—Water sprayed over the soil surface through nozzles from a pressure system

Subirrigation—Water applied in open ditches or tile lines until water table is raised sufficiently to wet the soil.

Ingny—See Cheese. Also a type of highly flavored butter made in some European countries

Island of Orleans—See Cheese

Isoelectric Point—The electric null point e.g., that hydrogen ion concentration at which a protein shows no cataphoretic motion in an electric field

Isolation of Animals—Keeping animals in a pen or lot away from other animals. This is done when an animal is suspected of having some infectious or contagious disease.

Isolation Stalls—Isolation stalls are stalls or pens for keeping animals separated from the rest of the herd. They are used to keep animals which have contagious or infectious diseases or for isolating animals which have been newly acquired and cannot be put with the herd until the results of certain tests have been received. See Handbook Article on Dairy Farm Structures P 210

CH₃

Isoleucine — $\text{CH}_3\text{CH}_2\text{CH}(\text{CH}_3)\text{CH}(\text{NH}_2)\text{COOH}$
An amino acid found in milk proteins. Casein and B-lactoglobulin contain respectively 61 and 84 gms. per 100 gms.

Italase, Italian Cheese, Italian Pasta Filata
Sizes and Shapes of—See Cheese.

Italian Rye-Grass—See Feeds and Feeding

J

Jack Cheese—See Cheese.

Jacketed Vats with Agitators—See Vats

James Bell Milk Drier—See Milk Processing and Drying Equipment

Japan Clover, Japanese Cane—See Feeds and Feeding

Japanese Heartnut, (walnut), (Juglans Sieboldiana Cord formos)—A nut either heart shaped or the shape of a guinea egg and having a flavor like that of the American butternut. It is used in ice cream often

in the place of the pecan. These nuts have a hard thin shell which is easily removed without breaking the nut

Japanese Millet—See Feeds and Feeding.

Jelly—A more popular and less rigid scientific term than gel although practically synonymous with it

Jensen-Hirschner Value—A measure of the butyric acid in fats. It is represented by the number of cc. of N/10 alkali required to neutralize a distilled Ag₂SO₄ filtrate from

00 cc. of Reichert-Meissl distillate. The presence of butyric acid is especially characteristic of milk fat, and this determination is helpful in detecting the adulteration of milk products. A low value indicates the probable adulteration of milk fat with some other fat. Normal butter fat has a Jensen-Kirschner number of 20-26.

Jersey—A breed of dairy cattle originating on the isle of Jersey in the English channel and now widely distributed in the United States. They are rather small and have short horns; their color ranges from a yellowish brown to fawn through grays to nearly black. They are noted for their richness of milk. They weigh from 800 to 1000 lb. and will produce between 6000 and 7000 lb. of milk containing 5.2% butterfat on the average. See Handbook, P. 266.

Jerusalem Artichoke—See Feeds and Feeding.

Jet Condenser—See Milk, Processing and Processing Equipment.

Jimson Weed—A poisonous plant attributed as one of the causes of milk sickness. (A disease which has affected man and also calves.)

Job Efficiency—In contemplating the erection of a plant, use should be made of the most modern ways of constructing and arranging all machinery so as to get the best possible product with a minimum of pipes and so arrange to get the work done with minimum effort. Health experts should be consulted with a view of getting plant constructed so that work may be done under most healthful conditions; less sickness means more efficiency. Psychologists, engineers and cost accounting experts should be

consulted so as to get the work done under most congenial conditions and with least effort. Experts have accomplished marked results by careful application of the amount of motion and time that goes into a job. It often pays to have re-surveys made of most efficient ways of accomplishing the various jobs throughout the plant. The efficiency experts are generally able to suggest methods of increasing efficiency and lowering costs in a plant.

Jochberg Cheese—See Cheese.

Johne's Disease—See Diseases in Cattle.

Johnson Grass—See Feeds and Feeding.

Josephine Cheese—See Cheese.

Joule—A term denoting 10⁷ absolute units of work (ergs) represented by the energy expended in one second by 1 ampere through 1 ohm. One joule equals 0.24 small calories or .738 foot-pounds.

Jowl—A jaw, or double chin. In cattle generally known as the dewlap.

Judging—A term used in comparing cattle in the show ring. The term is also used by experts in comparing dairy products, such as butter, cheese, ice cream or milk. For references see books on Dairy Cattle and Judging Of Dairy Products by Nelson and Trout.

Jumbo Brick—See Cheese.

June Grass—See Feeds and Feeding.

Junior, Junior Twin—See Cheese.

Just System, Just Hatmaker Process—See Milk, Processing and Processing Equipment.

K

Kaelder Milk—See Milk, Processing and Processing Equipment.

Kafir—See Feeds and Feeding.

Kainit—A fertilizer containing potassium and sodium chloride with not less than 12% potash. It sometimes contains sulfate of magnesia.

Kajmak Cheese—See Cheese.

Kale, Kaoliang—See Feeds and Feeding.

Karab Cheese—See Cheese.

Karaya Gum—Same as Indian Gum and Gum Bassora.

Kareish, Karut, Kasach, Kascaval, Kasserli, Katschkawalj, Katzenkopf—See Cheese.

Keel-bone—The breast bone or sternum.

Keeping Quality Test for Cheese—See Cheese.

Kefaloty—See Cheese.

Kefir—See Milk, Processing and Processing Equipment.

Kelco-Gel—A trade name for an ice cream stabilizer prepared from kelp, a seaweed. See also Sodium Alginate

Kellners Feeding Standard—See Feeding Standards

Kelp—Various types of large brown seaweed. The giant kelp of the Pacific coasts of North and South America and all southern waters. It is said to grow to 700 feet in length—the largest of all known plants. These plants are used to some extent in stabilizers for ice cream because of their sodium content, and when dried are valuable for cattle feed because of their iodine content. See Sodium Alginate and Feeds and Feeding

Kentucky Bluegrass—See Feeds and Feeding

Keratin—A gelatinous substance obtained from hoofs, nails and hair of animals

kernel—The whole grain of seed of a cereal as of wheat or corn

Kerosene Emulsion—A contact insecticide, prepared by emulsifying kerosene in a hot soap solution

Kerry—A breed of dairy cattle originating in southern Ireland where they have been bred for centuries. It is of a distinct dairy type, the cows weighing about 800 lb. at maturity. They are vigorous and well adapted to severe weather conditions and are good grazers on scanty pastures. They produce from 5000 to 6000 lb. of 4% milk, although individuals have produced as much as 10,000 lb. of milk. Very few are to be found in the United States.

Ketosis or Acetonemia—See Diseases in Cattle

Kettle Heater—See Danish Heater

Kettles, Processing, (in cheese)—See Cheese

Kgm—Kilogram

Khoa—See Milk Processing and Processing Equipment

"Kidding" Period—Term designating the period when cows or goats are in heat. Also called "Rutting" period

Kidney Beans, Kidney Bean Straw—See Feeds and Feeding

Killefer—A deep tillage implement consisting of one of a series of blades or strong knives that are pulled by a tractor through the soil at an adjustable depth, usually deep

Kilogram—A unit of mass and weight equal to 1000 grams or approximately 2.201 lb. avoirdupois

Kilometer—A measure of length equal to 1000 meters or approximately 3280.8 ft

Kilowatt—Abbreviated kw. Large electric unit for measuring rate of doing work, i.e. —Volts x Amperes x 1000 equivalent to 1.34 horsepower. See also Watt

Kilowatt hour—Abbreviated kwh or kw-hr. Kilowatts times hours used. For example, 40 kw. maintained for one half hour equals 20 kwh., or 5 kw. maintained for 4 hours also equals 20 kwh. 1 kw-hr = 3412 Btu = 2654.200 ft.-lb.

Kinase—A substance which converts the inactive form of an enzyme into its active form

King System of Ventilation—A widely used system of ventilation for dairy barns. Briefly, it consists of a large flue opening near the floor and extending above the roof of the barn for the escape of the impure air and a series of small openings on either side of the barn through which fresh air may enter. Its successful operation depends largely on a tight closed barn and proper atmospheric conditions.

Kip—The undressed hide of a young steer, cow or horse

Mixscherkäse Cheese, Kjørgaard Cheese—See Cheese

Kjeldahl Method—See Dairy Tests

Klim (Borden's) (Milk, spelled backwards)—Spray process powdered whole milk. Vacuum packed for infant feeding and for all milk uses where fluid milk is not readily available. It is packed by a special process in an inert gas to keep almost indefinitely. It is produced under the advisory standard of the Food and Drug Administration there being no legal standard. Thus in compliance with the standard it contains 26% but terfat. Much of the product is sold in foreign fields.

Kloster Cheese—Knaust—See Cheese

Knead—See Cheese

Knee Halter—A form of halter fastened to the head and a knee of a cow or other animal. A sort of hobble to handicap cow's movement.

Kniaseff Test—See Dairy Tests

Knock-kneed—A deformity in which the legs come too near together at the hocks and are bent outward laterally below the hocks.

"Koagulation" Vitamin—See Vitamins.

Koetstorffer Value—See Saponification Number.

Kohlrabi—See Feeds and Feeding.

Kohmann Method—See Dairy Tests.

Kolos-Monostor, Kolosvarer, Kopanisti, Koppen—See Cheese.

Korean Lespedeza—See Feeds and Feeding.

Kosher Cheese, Kosher Gouda—See Cheese.

Kosher Milk—See Milk.

"Kottage"—See Cheese.

Krause Centrifugal Spray Dryer Process—See Milk, Processing and Processing Equipment.

Krauterkäse Cheese—See Cheese.

Kreis Test—See Dairy Tests.

Krutt Cheese, Kryavac—See Cheese.

Kudzu—See Feeds and Feeding.

Kühbacher, Kumbach, Kuminost (Konimenost)—See Cheese.

Kumiss—See Milk—Fermented.

Kummelkase, Kurini, Kustner—See Cheese.

K Value—The conductivity of substance measured by the B.T.U. transmitted per hour, per square foot, per inch, or per foot thickness per degree difference in temperature on the two sides of the plate. This conductivity or k value is different for different materials.

See Table on Heat Transfer Values of Some Common Materials in the Reference section, P. 323.

K.V.A. (Kilo-volt-ampere)—The usual measure of output of alternating current and the input to the main switchboard; that is, K.V.A. is the abbreviation for one kilo volt-ampere (1000 volt-amperes). Kilowatts = volts \times amps. If the power factor of the load happens to be 100%, then and only then is one kilo volt-ampere the same as one kilowatt (kw).

L

Lah, Laab—See Cheese.

Labelling of Foods—For legal and correct labelling of foods see current issues of U.S. Food Standards and Drugs Act, published at Washington, D. C.

Labneh—See Cheese.

Labor Saving Devices in Dairying—See articles on Management in the Handbook section, P. 11; 210.

Laboratory Pasteurization Test—See Dairy Tests.

Laboratory Re-Pasteurization Test—As a check on efficiency of pasteurization, many laboratories use a laboratory re-pasteurization test. For details See Dairy Tests.

Laboratory Test—See Dairy Tests.

Lactal System—The system of gland cells, ducts and cisterns in the udder by means of which milk is manufactured and discharged from the udder.—Mammary system.

Lactalbumin—That fraction of the serum proteins of milk which is not precipitated by 50% saturation with ammonium sulfate. It consists of B-lactoglobulin, α -lactalbumin, bovine serum albumin, and a number of other components which have not yet been isolated and characterized. This milk protein forms about 5% of normal cow's milk.

α -Lactalbumin, present in the lactalbumin fraction of the milk serum proteins has been prepared in crystalline form. Milk contains about 1 gm. of α -lactalbumin per liter. See Albumin and Lactoglobulin.

Lactase—An enzyme capable of hydrolyzing lactose into its constituent monosaccharides, glucose and galactose. It is not present in milk but occurs in certain strains of yeast and other microorganisms.

Lactation—The secreting and yielding of milk by the mammary gland. In dairying, the lactation period is that time between calvings during which the cow produces milk.

Lactenin—A chemical substance (probably a protein) in freshly drawn milk which slightly inhibits the growth of bacteria. Possibly responsible for the so-called germicidal action of milk.

Lactic Acid— $\text{CH}_3\text{CH(OH)COOH}$. An organic acid formed in the souring of milk. It is produced by the action of bacteria, particularly *Streptococcus lactis* upon the lactose (sugar) of milk.

Lactic Acid Fermentation—The biochemical reaction normally produced by bacteria in milk, chiefly *S. Lactis*. Lactose is fermented with the resulting end product being lactic acid.

Lactic Acid, Production of, by organisms—*S. lactis*, *S. pyogenes*, *S. liquefaciens*, *S. cremoris*, *L. thermophilus*, *S. citrovorus*, *S. kefir*, *S. thermophilus*, *Tbm lactis* and *Tbm bulgaricum* all produce lactic acid.

(*S* = *Streptococcus*, *L* = *Lactobacillus*, *Tbm* = *Thermobacterium*)

Lactobacillus Acidophilus—The organism used in acidophilus milk. Regularly present in normal intestinal tract of man and other warm blooded animals. Used to establish desirable intestinal flora because it is able to grow at the low surface tension existing in the lower intestinal tract much better than *L. bulgaricus*. A gram positive rod 1.5 to 2.0 microns in length.

Lactobacillus Bulgaricus—The lactobacillus which is the fermenting organism in Bulgarian buttermilk. The organism is generally the largest of the lactobacilli. Unusually long chains are common and especially large amounts of acid are produced. Formerly widely used to overcome putrefactive conditions in the intestine but recent evidence tends to show that it is not so well adapted for the intestinal tract as *L. acidophilus*.

Lactobacillus Casei—A lactobacillus generally present in normal milk in greatest numbers. Very important in cheese ripening. Also an important organism concerned with protein breakdown in Cheddar type cheese. This breakdown produces a part of the characteristic flavor of Cheddar cheese.

Lactobacillus Group—A group of organisms regularly present in dairy products. The more important members of this group are *L. casei*, *L. acidophilus* and *L. bulgaricus*. The organisms are rod like in shape and vary in size. They are gram positive non spore formers and non motile. They have

a high acid production and tolerance play an important role in the ripening of certain cheeses and are commonly found in pure cultures that are used for starter making.

Lactochrome—See Riboflavin

Lactolorm—A commercial preparation of casein. It consists essentially of casein precipitated by metallic salts and subsequently hardened by formaldehyde. It is employed in place of horn, ivory, ebony, and amber.

Lactogen (Galactin)—A hormone which brings about the secretion of a fluid resembling colostrum milk, the milk first secreted after a cow latches. This hormone is secreted by the anterior lobe of the pituitary gland located at the base of the brain.

Lactogenic Hormone—Same as prolactin or galactin, the pituitary hormone which stimulates the secretion of milk.

Lactoglobulin—The fraction of the milk serum proteins which is precipitated by 50% saturation with ammonium sulfate. It contains the euglobulin and the pseudo-globulin. In Colostrum contains much more lactoglobulin than normal milk.

B-Lactoglobulin—A milk protein present in the lactalbumin fraction of the milk serum proteins has been prepared in crystalline form. It is especially characterized by its content of sulphydryl groups which are activated by heating.

Milk contains about 3 gms of B lactoglobulin per liter.

Lactometer—An instrument for estimating the specific gravity and the solids content of milk. It consists of a cylindrical instrument so weighted that it floats upright in milk and is based on the principle that a body floating in a liquid is pushed upward by the liquid with a force equal to the weight of the displaced liquid. Lactometers are of two types: the Quevenne lactometer which has a thermometer attached and which gives directly the specific gravity readings in the last two decimal places, for example specific gravity reading 1.032. Quevenne lactometer reading 32 and the New York Board of Health lactometer which has a scale ranging from 1 to 100 with the result that this reading must be changed in order to obtain the true specific gravity. See Quevenne and New York Board of Health lactometers.

Lactometer 102° F New Method of Determining T.S. in Milk—See Dairy Tests

Lactomucin—A mucoid protein which is thought to constitute the nitrogenous film which surrounds the fat globules in milk.

Lactora (Borden's)—Spray process nonfat dry milk. Prepared especially for making buttermilk, chocolate drink, and other fluid milk "extra products."

Lactoscope—An instrument which was designed to estimate the amount of fat in milk. A white glass cylinder with black lines is fitted by means of a stopper into a larger glass of cylindric shape, constricted below and having an aperture at the top. Four cc. of milk are measured accurately and placed in the large glass cylinder. Enough water is added to permit the black lines of the small cylinder to appear clearly. The line on a level with the surface of the liquid indicates the amount of fat. It was claimed that when used in conjunction with the lactometer, either skimming or watering of the milk or both could be detected by the opacity of the milk. The instrument is not considered very accurate and is not now in use.

Lactose— $C_{12}H_{22}O_{11}$. The principal sugar of the milks of all mammals. Cow's milk contains 4.5-5.0% lactose; human milk contains about 6.6%. Lactose is a disaccharide sugar consisting of one molecule of glucose and one of galactose and yielding these sugars upon hydrolysis.

Lactose exists in two stereoisomeric forms, α and β , which are in equilibrium with one another in solution, the proportions of each depending on the temperature. At 20° C. (68° F.) the equilibrium ratio α/β is 0.63.

Crystallization of lactose solutions at temperatures below 93° C. (199.4° F.) yields crystals of α -lactose monohydrate. Crystallization above 93° C. (199.4° F.) yields crystals of β -lactose anhydride.

(Lactose is used in modified milks, in confections, in pharmaceutical preparations, and in corrective nutrition.) See Alpha Lactose and Beta Lactose.

Ladino Clover—See Feeds and Feeding.

Ladled Butter—See Butter.

Lag Phase—In bacteriology—that period of the growth curve which a newly inoculated mature culture may pass before reproduction begins. During this lag phase there is no apparent bacterial growth.

Lagule Cheese—Lalmures (in Cheese)—See Cheese.

Lair—Kind or character of soil, as for crops or pasture.

Lamellae—See Ice Cream.

Lamina—Blade or expanded portion of a leaf.

Lamp Black—Soot produced and used commercially. See Cheese.

Lancashire Cheese—See Cheese.

Land—The solid part of the surface of the earth, as distinguished from water. The area of land is roughly 55,000,000 square miles; that of the water, 142,000,000 square miles.

Ground, especially in respect to its situation, nature, or quality; unplowed ground between furrows; unplowed portion of a field; any of several portions into which a field is divided for convenience in plowing.

Landplaster—See Gypsum.

Landscape—All the features that distinguish one part of the earth's surface from another part; that portion which the eye can comprehend in a single view; including all the objects as seen; to improve by landscape architecture or gardening.

Landscaping—The designing and developing of landscapes, especially parks, estates, cemeteries, boulevards, private grounds, etc.

Land Slide—In plowing, the side of a furrow next to the "land."

Land Slide—1) Rapid movement down slope of a mass of soil, rock, and debris. 2) Mass of material brought down by the slide.

Land Type—See Soil Association.

Lange Wei, Langres Cheese—See Cheese.

Lanital—A wool made from the casein of milk. In appearance, handle, tenacity, warmth, and crease-resisting properties, the finished product has the same qualities as sheep's wool. First developed in Italy to replace wool.

Lap Fold, Packaging—See Cheese.

Lapland Cheese—See Cheese.

Lariat—A long, small rope of hemp or strips of hide with a running noose, used for catching cattle, horses, etc., a lasso. A similar rope, with or without the noose, used for picketing cows, horses or mules while grazing.

Lasso—Same as Lariat

Latent Heat—"Hidden heat" The quantity of heat that must be absorbed by a unit mass of a body in a given state in order to convert it into another state without changing its temperature See Internal Latent Heat

Latent Heat of Fusion—The quantity of heat absorbed in bringing about the liquefaction of a solid without any change in the temperature of the solid The latent heat of fusion for ice is 80 calories or 144 Btu Therefore 80 calories are required to change 1 gram of ice to water or 144 Btu are required to melt 1 pound of ice without a change in temperature

Latent Heat of Vaporization—The quantity of heat necessary to change 1 gram of liquid to vapor without change of temperature It is measured in terms of calories per gram The latent heat of vaporization of water is 536.6 calories or 970.4 Btu Therefore to vaporize water to steam of the same temperature, 536.6 calories per gram or 970.4 Btu are required

Latin Squares—A particular design for an experiment in which the results are to be statistically analyzed The object of the design is to equalize known sources of variation over all the treatments under study It is a design in which each treatment appears once and once only in each row and in each column and where each column represents a level in the source of variation in the columns and each row represents a level in the source of variation in the rows

Latticini Cheese—See Cheese

Lauric Acid— $C_{12}H_{24}COOH$ A saturated fatty acid found in butterfat, ranging from 3-4%

Laurin—A milk fat forming about 7.5% of butterfat A combination of lauric acid and glycerol

Law of Diminishing Return—As applied to farming the observed fact that in any given stage in the cultivation of the land or the production of livestock any increase in labor or capital beyond a certain point is not rewarded with a proportionate increase in the production from the unit to which the capital or labor is applied

Laxative Feeds—See Feeds and Feeding

Lay—The plowshares of a moldboard plow

Lay By—To harvest to finish the cultivating of a crop at corn

Lay-down Cooker—See Cheese

Lbs—Pound or pounds

LCL—Abbreviation for Less than Carload Lots

Lea (Lev)—Pasture or grassland as arable land in grass a pasture, or meadow

Leaching—The loss of fertilizer elements in solution especially by the action of free water percolating through a soil profile

Lead Arsenate—(Insecticide) A chemical compound extensively used as a poison against chewing insects

Lead Poisoning (Paint Poisoning)—Due to the ingestion of lead or paints containing lead large numbers of farm animals, particularly dairy cattle are poisoned annually by the paints or paint products carelessly left in the way of cattle Calves are particularly susceptible as they are very fond of licking fresh paint from barn posts stanchions etc They also frequently find access to carelessly left partially filled paint cans or buckets Even small amounts of lead or paint containing lead will cause fatal poisoning Other sources of danger are pastures near orchards where sprays containing lead may have contaminated the grass It has also been found that vegetation covered with a layer of lead dust near smelters has been fatal to animals consuming such feed

Leaf—An organ of a plant arising at a node on the stem, the primary function of which is the manufacture of food The specialized leaves in the seed are called cotyledons

Leaf Cheese—See Cheese

Leaf Mold—A soil composed chiefly of decayed vegetable matter, as fallen leaves Any mold or mildew of foliage

Leaf Sheath—The basal portion of some leaves which sheaths the stem, characteristic of grasses

Leak Detector—A mechanical means present on all continuous milk lines for the purpose of "stripping out" defective containers from the sound ones during the process

Leak Detector Valve—See Milk and Cream Processing and Processing Equipment

Leaky Body—See Butter Defects

Lean—Having little fat, or free from fat

Lease—A contract by which one conveys lands, tenements, or hereditament for life, for a term of years, or at will, or for any less interest than that of the lessor, usually for a specified rent or compensation.

Leather—The skin of an animal, or some part of such skin, tanned, tawed (using minerals as alum, etc.), or otherwise dressed for use, to render it resistant to putrefaction and relatively soft and flexible when dry.

Leather Cheese—See Cheese.

Leben—See Milk and Cream, Processing and Processing Equipment.

Lecithins—A class of phospholipides, each molecule of which consists of one molecule of glycerol esterified with two molecules of fatty acid, one molecule of phosphoric acid and one molecule of choline.

Lecithins are present in milk in small amounts. They have a phosphorus-nitrogen ratio of one.

Legal Regulations—Since adulteration of food could be a very profitable business, temptation to adulterate is great. Hence, the necessity for our stringent food and drug regulations to protect the general public. See City, State and Federal Regulations and Food and Drug Acts for details.

Legume, Legume Chaff, Legume Silage, Legume Straw—See Feeds and Feeding.

Lehmkuhl Set—An apparatus used to test the strength of chlorine in chlorine disinfectants. One standard is employed for testing any solution from 3-500 parts per million (p.p.m.) of available chlorine by diluting solutions stronger than 3 p.p.m. to that concentration.

Leicester Cheese—See Cheese.

Lemma—Outer flowering glume of a grass flower. Also, outer glume on a grass seed.

Lemo-Lac—A quite popular milk drink. See Milk Drinks.

Lemon Oil—The volatile oil obtained from the peel of the lemon from which the harshly flavored terpenes are usually removed. The Food and Drug Administration recognizes its production in two ways:

- (1) By direct expression of oil from the fresh peel.
- (2) Alcoholic solution of the fresh peel.

The oil is used ordinarily as a supplementary flavor in ice creams, sherbets, and ices.

Lentil—See Feeds and Feeding.

Leptospirosis—See Diseases in Cattle.

Lescin Cheese—See Cheese.

Lespedeza, Lespedeza Sericea, Lespedeza Straw—See Feeds and Feeding.

Lethals (death products)—In genetics, inherited traits or factors which produce the premature death of an organism under conditions which a normal individual would survive. Lethal characters are usually recessive; i.e. they are produced by apparently normal but heterozygous (with unlike chromosomes) parents.

Lethality—Sterilizing value; as in the continuous sterilization process a precise time-temperature relationship is established which permits high efficiency of sterilization of the product as in evaporated milk. Known and accepted mathematical procedures are used to determine this value.

Leucine— $C_6H_{13}NO_2$. An amino acid found in milk proteins. Casein and B-lactoglobulin contain respectively 9.2 and 15.6 gms. per 100 gms.

Leucocyte—Any colorless ameboid cell mass, such as a white blood corpuscle, pus corpuscle, lymph corpuscle or wandering connective tissue cell usually found in normal blood. These cells contain proteins, glycogen, lecithin, cholesterol, and salts. When acting as blood scavengers, they are known as phagocytes. They are often present in milk in large numbers—probably due to udder diseases.

Leuconostoc—Thread-like forms of bacteria, a genus of Lactobacteriaceae. *L. citrovorum* and *L. dextranicum* are aerobic, spherical cells occurring in pairs and chains and do not have photosynthetic pigments as do blue-green algae *Nostoc* from which they derive their name. They are found in sugar factories and in milk. They are used in starter cultures for sour cream, butter-milk and butter where they produce desirable flavors from citric acid fermentation, therefore are often "aroma bacteria." They rarely survive pasteurization.

Leyden Cheese—See Cheese.

Lice—See Diseases in Cattle.

Liederkranz Cheese—See Cheese.

Life Cycle—The record of all the various stages of growth of an organism from its beginning until its death.

Life in Milk—An old term said to refer to the presence of enzymes in milk

Lift Truck—A small truck commonly employed in dairies. It is a labor saving device being used to lift platforms upon which cases bottles cans etc. are placed to move from one place to another

Limburger Cheese—See Cheese

Lime—A caustic highly fusible solid white when pure obtained by calcining limestone shells or other forms of calcium carbonate called also quicklime burnt lime live lime etc. Chemically pure lime is calcium oxide CaO but commercial limes commonly contain impurities as magnesia alumina iron oxide and silica. Lime is used in agriculture to sweeten soil. See Calcium. See Lime as a Neutralizer in Cream and Ice Cream

Limestone, Ground—A material used to correct soil acidity and add calcium and/or magnesium to the soil. Rocks or rock material composed chiefly of Calcium carbonate or Calcium and Magnesium carbonate. See Feeds and Feeding

Lime sulfur—A fungicide and insecticide obtained by boiling sulfur with lime and water or by complete evaporation

Lime Water—A solution of calcium hydroxide Ca(OH)_2 which is soluble in water to the extent of 0.14 part in 100 parts at ordinary temperatures or about 121.7 grains per gallon

Light Cream—See Milk and Cream

Light, Effects of on Dairy Products—Light energy brings about definite chemical reactions affecting flavor and vitamins. It can cause destruction of Vitamin C and induces undesirable flavors in butter and cheese. Obviously in the manufacturing and storing of milk butter and cheese efforts should be made to protect them as far as possible from direct sunlight

Lightning Rod—A metallic rod set up on a building and connected with the moist earth or water below to diminish the chances of destructive effects of lightning. The rod helps to equalize the potential of the clouds and the earth

Light Soil—A soil that is easy to till. A soil containing much sand

Lignin—A group of complex chemical substances found in the fibrous parts of plants. It is much less digestible than cellulose

Legule—In grasses a thin paperlike (membranous) or hairy projection at junction of blade and sheath. Also a continuance of the lining of the sheath

Landane (Fly Spray)—A residual spray recommended for use in the barn milk house and on all cattle excepting young calves. This insecticide is poisonous and should be used with precaution. Cover the mangers and water cups and protect all feed from the spray whenever it is being used

Linear—Long and narrow in a straight line

Line Breeding—A system of breeding which involves the mating of two animals to concentrate on the qualities of some superior ancestor. Line breeding differs from inbreeding in that other ancestors of the two animals are more distantly related. Briefly a form of inbreeding in which an effort is made to maintain a high degree of relationship to some superior ancestor. Pedigrees of line bred individuals show the repeated occurrence of a particular ancestor

Line run Sampling—This practice in dairy plants is generally based upon the flow of the product into and through the plant to its final desination. This often provides needed information in tracing down defects in quality. If the source of trouble is unknown

Line run Testing—A term applied by laboratory technicians to pinpoint the exact place of faulty operation in the processing plant. Samples are taken at different points in the processing procedure about as follows: 1. The raw supply before entering the plant. 2. At the dump tank. 3. From the pre-cooler. 4. From the storage tank. 5. From the pasteurizer. 6. From the cooler. 7. From the finished bottle. However some times it is necessary to take samples intermittently from the same source every 15 or 30 minutes to get an accurate check of the functioning of a certain apparatus

Line Run Test—See Dairy Tests

Lane Test—A test used in determining the extent of bone calcification in vitamin D bio-assays on rats. This test is made on the proximal end of the tibial or distal end of the radius or ulnae. After cleaning the bone and staining with a 2% solution of silver nitrate records are made of the degree and extent of calcification of the radioc metaphyses (transformations)

Link (in Cheese)—See Cheese.

Linkage—As applied to genetics, a restriction on independent assortment in which certain genes tend to remain together in the process of segregation and transmission from one generation to the next, owing to their being located on the same chromosome.

Linoleic Acid— $C_{18}H_{34}O_2$. A naturally occurring polyunsaturated fatty acid which is essential for animal nutrition, found in vegetable fat.

Linolenic Acid— $C_{18}H_{32}O_2$. A naturally occurring polyunsaturated fatty acid which is essential for animal nutrition, found in vegetable fat.

Linolin—So-called essential non-saturated fat.

Linseed—The seed of flax.

Linseed Cake, Linseed Meal, Linseed Meal (New Process), Linseed Meal (Old Process)—See Feeds and Feeding.

Linseed Oil—A yellowish drying oil expressed or extracted from flaxseed. It has many and varied uses.

Lipase—A fat-splitting enzyme which has been shown to be a normal constituent of the milk of cows that have been in milk for an abnormally long period. This enzyme splits up the fat into glycerol and fatty acids, the latter being responsible for some of the off-flavors in dairy products. Cases of rancidity in milk products are attributed chiefly to the release of butyric acid in the butterfat by the enzyme, lipase.

Lipide—Any of a group of biologically important substances which are related to fatty acids as esters, either actual or potential and are insoluble in water and soluble in fat solvents such as ether, chloroform and benzene. The lipides include fats, oils, waxes, phospholipides, glycolipides, phosphatidic acids, sulfolipides, fatty acids, sterols, alcohols, and certain nitrogen bases and fatty aldehydes.

Lipoids—A term applied to a group of substances, including fats and esters possessing analogous properties, e.g. lecithins, phosphatins, sterols. Also known as lipins.

Lipolysis—The decomposition or splitting up of fat.

Lipolytic Organisms—Bacteria and yeast which are capable of splitting or decomposing fats.

Lipoprotein—A protein which is combined with a lipid from which it cannot be freed without rather drastic treatment. Milk contains a lipoprotein or lipoproteins adsorbed on the fat globules.

Liptauer Cheese—See Cheese.

Liquefiers—Bacteria which cause the liquefying of milk solids, often associated with those which cause sweet curdling. Liquefying (or Proteolysis) is the process by which casein is broken down to a water soluble compound. The degree of decomposition from these two processes depends largely upon the types of organisms and the temperatures. *Streptococcus liquefaciens* is one of the most important organisms in this group, which as a whole is associated with unsanitary conditions of production.

Liquid Receiver—In Mechanical Refrigeration, a storage or tank for keeping liquefied ammonia, coming from the condenser, until it is discharged again through the expansion valve. See Receiver.

Liquid Sugar or No. 1 Syrup—See Ice Cream.

Liquor Chocolate—See Chocolate Liquor.

List—A stripe, band, or belt, of color, as on an animal's body. One of the ridges made in listing. In southern United States, to prepare land for a crop by making alternating beds and furrows, as in growing cotton and of corn.

List of Dairy Books, Trade and Scientific Journals—See Reference Section.

Lister—A double moldboard plow which throws a furrow slice or ridge both ways. It is generally equipped to prepare a seed bed at the bottom of the furrow by means of small sub-soiling attachment and is used mainly in corn-growing regions of restricted rainfall.

Lister Drill—A machine in which such a plow is combined with a drill which plants as the furrow is opened.

Liter—1 liter equals 1.05668 U. S. liquid quart or 0.264 U. S. liquid gallon. See Weights and Measures.

Litter Carrier—Litter carriers are metal containers which are usually run on a track back of the cows in a dairy barn in which the manure and litter from the gutter or pen can be loaded and carried to the manure pit or dumped directly into a manure spreader. Sometimes these containers are on rubber tired trucks instead of tracks.

Livarot Cheese—See Cheese

Live Birth—Indicating signs of life after the extrusion of the whole body at birth.

Live Weight—In meat animals the weight before slaughtering.

Loading Chute—A loading chute is a ramp by which animals may be loaded onto a truck. Sometimes a natural chute can be provided to which a truck can be backed up to a level even with the bed of the truck and the animals can then be loaded on the level. When this is not possible a sloping ramp can be built with sides and with slats across to keep the animals from slipping. The animals are led up this ramp and into the truck.

Loaf Cheese—See Cheese

Loam—A type of soil consisting of a friable mixture of sand, silt and clay with no one of these dominant.

Loamy—Like loam.

Loco—To poison with locoweed as cattle or horses to render insane or mad.

Locus—As applied to genetics a definite point or region in a chromosome at which a genetic factor is located.

Lodge—Beaten down as growing grain by wind or rain or too heavy growth.

Lodigiano—See Cheese.

Loess Soil—A fine-grained aeolian deposit dominantly of silt-sized particles found in various parts of the United States. It is a highly productive soil when properly banded.

Logarithmic Phase—The logarithmic phase of the bacterial growth curve is that phase in which reproduction is progressively accelerated i.e. the rate of increase per organism remains constant. It has its beginning with the initial division which terminates the lag phase and continues assuming a geometric rate of multiplication until there is a rather sudden breaking off in the reproductive rate.

Loin—The front part of a hindquarter of beef mutton lamb or veal with the flank removed. That part of the body of a quadruped on either side of the spinal column between the hip bone and the false ribs.

Lombardo—See Cheese

Long (A Stock Market Term)—One who owns stocks or commodities is said to be in a long position. Generally applied to one who believes price trend is upward.

Long Body (in cheese)—See Cheese

Longevity (Long life) of Cows—It is considered profitable to have a cow produce over a long period of time therefore longevity is a good characteristic to have in a cow family. It is estimated that a cow in her first two lactations just pays for the cost of raising her to producing age and that only after that does she begin to show a profit.

Long fed—Said of cattle kept on a fattening ration for a period of 120 or more days.

Long Hold—See Cheese

Longhorned—Cattle of Spanish origin now almost extinct often called Texas Long horns and at one time common in the Southwest.

Longhorn Cheese—See Cheese

Loose Housing—Of dairy cattle should meet the following specifications: large enough yards and shelters to permit the cows to move at will from indoors to outdoors and from resting area to place of feeding; milk handling facilities arranged in a compact group so as to conveniently bring the cows to the operator; mechanized milking operations should be a part of the plan. Loose housing should also provide easy working arrangement for self feeding of hay and the removal of manure with modern power equipment.

Loose Smut—A smut disease of cereals that renders valueless both the kernel and the glumes.

Lorenz Disc Tester—(See also Wisconsin Sediment Tester and Sediment Tester) It consists of a cylinder 2½ inches in diameter and 6 inches long which is surrounded by a steam or hot water jacket an inch space being left between the two. The milk is poured through the cylinder. The steam or hot water enters at the bottom and runs out at the top. A brass cap held in place by a clamp rod slips over the bottom of

the inner cylinder. This cap contains a wire gauze over which is placed the disc of absorbent cotton. The milk filters more rapidly when kept warm.

Lorraine Cheese—See Cheese.

Low Acid, Popcorn or Sweet Curd Cottage Cheese—See Cheese.

Low Heat Nonfat Dry Milk—See Milk, Processing and Processing Equipment.

Low Melting Resistance—See Ice Cream Defects.

Low Side in Mechanical Refrigeration—See Low Pressure Side.

Low-Pressure Side in Refrigeration—That part of a compression refrigeration system which extends from the expansion valve to the suction side of the compressor. It includes the evaporator.

Low Test—In Agriculture, a relative term used in milk testing, germination testing, fertilizer and lime analysis work, etc. A test below the average for the particular thing being tested. Example, a Jersey fat test of 4.0% may be low for the Jersey breed, yet a rather high test for the Holstein breed.

Lubricant—A substance possessing such properties that it will, when placed between moving parts of machinery, make the surfaces slippery and reduce the friction, and prevent cohesion between the lubricated surfaces. Ex. oil, graphite, etc.

Lucentini & Drago Number—A chemical index of the nature of butterfat. It is the number of cc. of .1N (one-tenth normal) alkali used to neutralize the acids soluble in saturated potassium sulphate. Butterfat gives values of 18.6 - 20.9; suet gives a value of 3, and cacao butter, 5.

Lucerne—See Feeds and Feeding.

Lumen-(Lumina)—Cavity or passageway of the Alveolus.

Lumpy Jaw—See Diseases in Cattle.

Lunch Cheese, Lüneberg Cheese—See Cheese.

Lur Brand, (Danish Brand)—See Butter.

Lustre—A softened oily brilliancy to the surface hair of an animal.

Lutin—See Progesterone.

Lye Solution—Any solution of caustic soda in water. One-half per cent solutions are used in cleaning and sanitizing rubber parts of milking machines; stronger solutions are used in the soak tanks of milk bottle washing machines.

Lymph—A coagulable fluid, almost colorless, in the lymphatic system. It contains white corpuscles but no red corpuscles.

Lyophile—A substance exhibiting a marked affinity for a liquid. The term is more general than hydrophile because the nature of the liquid is not specified.

Lyophilic—Having the qualities of a lyophile; that is, showing marked affinity for a liquid.

Lyophilization—The drying of a substance from the frozen state, usually under vacuum, by sublimation of solid water to vapor without passing through the liquid phase.

Lyophilization actually means to make a material readily soluble by freeze-drying, as is done for certain biological products.

Lyophobic—A substance having only slight affinity for a liquid. The term is more general than hydrophobe because the nature of the liquid is not specified. See Hydrophobe.

Lyre—See Cheese.

Lyse—To undergo cell destruction.

Lysin—A substance capable of destroying bacteria.

Lysine— $H_2N-CH_2CH_2CH_2CH(NH_2)COOH$. An amino acid found in milk proteins. Casein contains about 8.2 and B-lactoglobulin about 11.4 gms. per 100 gms.

Lysis of Phage—The destruction of bacterial cells by viruses or phage particles.

M

Maconnaish Cheese—Macqueline Cheese—See Cheese

Macroscopic—Large enough to be visible to the naked eye

Made-land—Areas filled artificially with earth trash or both

Maggot—A soft bodied grublike footless larva of an insect as that of the house fly applied especially to forms living in decaying matter flesh etc

Magnamycin (Carbomycin)—See Antibiotics

Magnesium (Mg)—One of the essential elements found in dolomitic limestone important as a constituent of chlorophyll An alkaline earth element present in milk in the amount of about 0.10 gm per liter

Magnetic releaser (milking machine)—Milk is drawn from each cow separately into glass jars by vacuum and the weight of milk from each cow is indicated on the dial scale above the jars The operator then opens a valve in the vacuum line the milk is drawn out of the jars delivered through a sanitary pipe line to the releaser in the milk house where it is filtered cooled and bottled

Maile Cheese—Maile Pencer—See Cheese

Milk Order Testing—A form of herd improvement testing used in isolated or sparsely settled farming regions where there are not enough farmers to support a dairy herd improvement association The farmer takes his own samples and sends them to some designated place where they are tested Often the county agent assists the farmer with this work.

Milner—See Cheese

Maintaining a Healthy Herd, Maintaining Good Reproductive Efficiency—See "Care and Management of Dairy Cows in Hand book P 14

Maintenance Ration—The amount of feed required to maintain an animal when doing no work and yielding no material product In other words an animal receiving a proper maintenance ration will neither gain nor lose in protein fat or mineral matter that is neither gain nor loss weight.

Maintenance Requirements—See Feeds and Feeding

Mainzer Hand Cheese—See Cheese

Maize (Indian Corn)—See Feeds and Feeding and Corn

Maize Mildew—A downy mildew attack on Indian corn

Majocchi Cheese—See Cheese

Major Breeds of Cows' Milk, Average Composition of—See Milk and Cream

Major Plant Food Elements—The plant food elements applied as fertilizer in major quantities—nitrogen phosphorous and potassium These constitute the NPK of fertilizers

Majority Thermal Death Point—The temperature at which in a given time the majority of bacterial cells are destroyed See Thermal Death Point

Make Sheets (in Cheese) See Cheese

Makoff Cheese—See Cheese

Male The sex which begets the young or produces spermatozoa by which the eggs of the female are fertilized also the functions organs and parts pertaining to that sex opposite to female

Malt Sprouts—See Feeds and Feeding

Malaria Fever—See Diseases in Cattle

Maltase—One of the enzymes of the intestinal juice which converts maltose into the simpler form of two molecules of glucose

Malted Milk—Malted Milk Powder—See Milk, Processing and Processing Equipment

Malty Flavor—See Milk and Cream Defects

Mammal—One of the mammalia the highest class of vertebrates including man and all other warm blooded animals that produce milk to suckle their young Other characteristics are the possession of lungs a 4-chambered heart and hair In general embryonic development occurs within the uterus the placenta attaching the unborn young to the mother

Mammals Milk—See Milk, Composition of.

Mammary Gland—One of two or more large compound glands, characteristic of the mammalia, which, in the female, secrete milk for the nourishment of the young. They vary in number from two to twenty-two.

Mammary System in Cows—That part of the cow which includes the udder, milk veins and teats.

Mammitis—See Diseases in Cattle.

Mammogenic Hormones—One or more hormones of pituitary origin thought to be responsible, alone or in conjunction with estrogen and progesterone from the ovary or placenta, for the development of the duct and alveolar systems of the mammary glands. It is questionable whether there are specific mammogenic hormones or whether the growth of the udder is rather the effect of action of such well-recognized pituitary materials as growth, lactogenic, adrenocorticotrophic and thyrotrophic hormones.

Mammoth Clover—See Feeds and Feeding.

Managed Milking—See Milking, Managed.

Manbollen Cheese—See Cheese.

Man-day—The work done by one man in one day; also, a unit consisting of one day's work by one man.

Man Hours—The number of hours worked by one man.

Manganese—See Trace Elements in Milk.

Mange—See Diseases in Cattle.

Mangels—See Feeds and Feeding.

Manger—A trough or open box in which fodder or grain is placed for cattle or horses to eat.

Manihot Meal—See Feeds and Feeding.

Mann's Acid Test—See Dairy Tests.

Manometer—An instrument for measuring the tension of gases, steam, etc.; a sort of pressure gage. The usual form of manometer consists of a U-tube, containing a liquid (water, oil, or mercury), one limb being connected to the system whose pressure is to be measured, the other being open to the atmosphere, or closed.

Manteca, Manteche Cheese—Manur Cheese—See Cheese.

"Manufactured Milk"—See Milk.

Manure—The excreta of animals, with or without the admixture of bedding or litter, and of varying stages of decomposition. Also referred to as barnyard or stable manure. It is used as a means of increasing the mineral and organic matter content of a soil.

Manure, Artificial—A type of manure formed by the decomposition of straw and other organic materials to which has been added mineral fertilizers and lime.

Manure Loader, Mechanical—Manure loaders are of two kinds—one of which is in the form of an endless chain which elevates the manure to be removed by a gutter cleaner and puts it into a manure spreader; the other type is one which has a shovel, (somewhat like a steam shovel) which can be attached to a tractor and operated by tractor power. It can be used to load manure from piles or from loose housing areas.

Manure, Poultry—The excrements of fowls, used for enriching soil. The average analysis, on a dry basis, is 6.27% nitrogen, 4.18% phosphoric acid and 1.96% potash.

Manyplies—The third stomach of a cow. See Omasum.

Maquce Cheese—See Cheese.

Marbling—Variegated like marble; suggestive of the markings of some kinds of marble, as an intermixture of fat and lean in meat. In ice cream the veining of a light color with a darker color as vanilla ice cream with chocolate veining.

Marches—See Cheese.

Margarine—Generally is composed largely of vegetable oils and some animal fats emulsified with skim milk, milk or cream. It may also contain a special emulsifier and some starter distillate with other desired flavor ingredients. Butterfat is also used in margarine. However, most manufacturers rely upon emulsifying the oils they use with nonfat milk solids. This may be used in the form of fluid skim milk or in the dried form. The skim milk should, of course, be pasteurized and lactic acid starter used to develop from 6/10 to 7/10% acidity. The general composition of this product is about 80% vegetable oil, 18% skim milk and approximately 2% of salt.

Brief directions are according to Whit-
 tier & Webb in "By Products of Milk"
 as follows.

✓ (a) The wet method The oil and skim
 milk are proportioned into a mixing con-
 veyor then dropped into a tank of water
 held at 35 to 40°F The quick chilling
 crystallizes the fat into granules after
 which the margarine is tempered, printed
 and packaged

✓ (b) Refrigerated drum method The oil
 and skim milk are premixed and dropped
 onto refrigerated double drums similar to
 the type of drum used to dry milk The
 thin sheet of emulsified oil hardens on the
 drums as it cools to 35°F during one
 revolution of the rolls The margarine is
 scraped from the drums, tempered and
 formed into prints at 40°F

✓ (c) Continuous chilling method The oil
 and skim milk mixture is emulsified and con-
 tinuously chilled by forcing it through a
 machine similar to the continuous ice
 cream freezer The margarine emerges from
 the chiller ready to print

✓ (d) Churning The oil and skim milk
 are emulsified to produce a creamlike prod-
 uct which is cooled and churned just as
 butter is churned When the emulsion
 breaks the margarine is worked and
 printed

Marginal Land—Land which may be
 brought under cultivation in competition
 with other more productive land only
 when economic conditions will warrant a
 return or reward of production equal to
 or greater than the cost of production

Margin of Cultivation—A term used in
 referring to land which is barely fertile
 enough or barely near enough to market
 to yield a return on labor and capital
 without affording opportunity for the pay-
 ment of rent

Marienhofen—See Cheese

Mark—An identification brand or device

Market—A gathering of buyers and sellers
 at a stated time and place for the pur-
 pose of viewing cattle, provisions or other
 merchandise offered for sale usually not
 by auction although often goods are sold
 by auction Sometimes such markets are
 known as sales barns The term market
 may also consist of a group of men espe-
 cially organized for the selling of stocks
 or bonds referred to as stock market, live
 market, grain market etc

Market Administrator (Milk)—See Milk
 Market Administrator.

Market Animals—Refers to animals sold on
 a livestock market

Market Area—An area or general region
 within which the various factors affecting
 prices are operating to produce a unified
 price structure within that area

Market Cream—See Milk and Cream

Marketing—Act of selling or of purchasing
 in or as in a market, also bringing or
 sending to market An article, or articles
 collectively from a market a purchaser
 also produce for the market

Marketing Agreement, Milk—A contract
 issued by the Secretary of Agriculture
 specifying that handlers of milk will pay
 producers in a given milk shed usually
 intermediate a certain minimum schedule of
 prices for their milk Such a contract is
 issued only after a hearing of parties in-
 terested gives evidence that such an agree-
 ment is desirable and it becomes effective
 only if at least two-thirds of the producers
 and a majority of the handlers accept the
 terms of the agreement

The marketing agreement also specifies
 how payment to producers shall be made
 and provides that a Market Administrator
 shall be appointed by the Secretary of
 Agriculture to execute the agreement and
 orders

Marketing Cheese—See Cheese

Marketing Cattle—Cattle not needed for
 herd replacements may be sold best when
 there is a demand for them but the
 usual practice is to sell them as heavy
 "springers" or soon after calving Milking
 cows are in greatest demand in the fall
 when milk prices are high Grade cattle
 are generally sold to commercial dairy peo-
 ple near the larger cities where they do
 not raise their own replacements The
 value of registered cows is based to a large
 extent on their foundation value for the
 herd The sale of these is generally found
 among new breeders of registered dairy
 cattle Sometimes they are sold at auction
 sometimes on consignment sales in which
 a number of breeders join as a practical
 way of selling off their surplus animals at
 minimum cost

Marketing of Milk—From the *Producer's Viewpoint*—See *Handbook* section, P. 96.

Marketing Order (as related to milk)—A ruling issued by the Secretary of Agriculture putting into effect or operation the terms of a Marketing Agreement for milk. These terms then become binding upon all handlers and producers of milk in the designated area whether or not they were signers of the original Marketing Agreement. Marketing orders usually are issued only if two-thirds or more of the producers and a majority of the handlers in a given market area have accepted a marketing agreement.

Market Milk—See *Milk and Cream*.

Market Terms—Terms indicating lower markets: "weak market," "weak feeling," "weak tendency," "easier tendency," "weak undercurrent," "weak undertone," all indicate an unsteady condition of the market in which the buying power is not strongly marked but prices have not slumped materially. Such expressions as "easing off," "weakening," "declining," "slipping," indicate that the prices are moving noticeably downward, while "break" means a substantial loss. A "bear or bearish market," indicates a downward tendency in the market.

Terms indicating higher markets: A "strong market" is one that is a little better than "steady," but not better enough to be called "higher." "Strength," "strong feeling," "strong tendency," "strengthening up," have about the same meaning. A "firm market" means one that is fully steady without the slightest hint of weakness. "Upward movement," "on the up grade," "improvement," all indicate advancing prices. A "bull market" or "bullish," the opposite of "bearish," indicates an upward tendency in prices.

Terms indicating a steady market: "steady," "unchanged," "stationary," "level," "on a par with" indicate that price conditions are practically the same as the day before.

Terms indicating movement: when livestock changes hands quickly, sales and purchases are rapidly completed, the market is called "active," "brisk," "moving freely," "lively." When sales are slow, bidders are not active, the market is "slow," "sticky," "dull," "dragging," "sluggish," "in the dumps."

Markisch Hand—See *Cheese*.

Marl—A lining material consisting chiefly of calcium carbonate mixed with sand, clay, organic matter, and other impurities in varying proportions.

Marolles Cheese—See *Cheese*.

Marshall Rennet Test—See *Dairy Tests*.

Marsh—Generally refers to a tract of soft wet land.

Mascarpone Cheese—See *Cheese*.

Masculinity—In livestock, the appearance resulting from the possession of well developed secondary male sex characters.

Mash—See *Feeds and Feeding*.

Master Farmer—A nationwide movement or honorary organization sponsored by certain farm papers, as, *Prairie Farmer*, *Wallaces Farmer*, *The Farmer*, *Nebraska Farmer*, *Ohio Farmer*, *Kansas Farmer*, *Michigan Farmer*, *Pennsylvania Farmer*, *Progressive Farmer*, and others to honor outstanding farmers in the various states. Awards of honorary membership are made once each year, based on a rather elaborate questionnaire, and a farm inspection by some representative of the paper making the award. Items usually considered on the score card in making awards are: Operation and organization of farm, 260; business method and ability, 200; general farm appearance and upkeep, 90; home life, 300; and citizenship, 150 points.

Mastication (Live Stock Feeding)—This is the process of chewing feed preliminary to swallowing. It occurs between the molar teeth in the back part of the mouth, where the coarse roughage is broken down into smaller particles, some of the whole grains are crushed, and the feed is mixed with saliva. The process of mastication excites the three salivary glands, causing them to secrete a large amount of saliva, which readily mixes with the food.

Mastitis—See *Diseases in Cattle*.

Mastitis Milk—Milk obtained from cows infected with mastitis. Such milk frequently has a distinctly altered physical appearance. It may have either a flaky, stringy, or watery appearance, a dark or abnormal color, or a distinct salty taste.

Maternal—Received through the mother; as, maternal inheritance.

Maternal Impressions—Impressions supposedly received by the dam at the time of mating or during pregnancy and believed by some to have an effect upon the offspring. In the past it was a common practice to have good type animals around at the time of service so that the dam would receive the desired impression. There are of course no grounds for belief in the efficacy of this practice.

Maternity Pens—A maternity pen or stall is a well bedded box stall (8 x 14 preferred) in which cows are kept at time of freshening. The cow is usually put in the stall or pen a few days before she is due to freshen and is kept there for a few days after freshening.

Maternized Evaporated Milk—See Evaporated Milk, Maternized.

Matting—See Cheese.

Maturation—In genetics the ripening of the generative cells.

Mature Animal—Any animal that has reached its full vigor and growth.

Mature Equivalent Basis (M E)—Vapp & Nevens estimate that cows of the Ayrshire, Guernsey and Jersey breeds calving at 2 years of age produce 79% as much as they do at maturity that is 6 years. Holstein 73%, Brown Swiss approximately 70% as much. The following table gives a set of correction factors for converting production records to a mature age basis.

Age Correction Factors for Annual Yield of Milk

To use this table first adjust the correction factor in the general table by taking into account the breed differences due to the relative time of maturity by adding or subtracting modified correction.

If Jersey add 3.6 mo
If Guernsey add 2.4 mo
If Ayrshire, subtract 3.6 mo
If Brown Swiss subtract 6.0 mo
If Milking Shorthorn, subtract 6.0 mo
If the breed is Holstein-Friesian, use the table without modification.

Example: If a cow is 2 years and 5.4 months of age the factors for the breeds would be Jersey, 1.27; Guernsey, 1.29; Holstein, 1.33; Ayrshire, 1.40; Brown Swiss, 1.46; and Shorthorn, 1.40.

Age y - m	Factor	Age y - m	Factor
1- 5.4	1.64	3- 1.3	1.21
1- 5.7	1.63	3- 2.2	1.20
1- 5.9	1.62	3- 3.1	1.19
1- 6.2	1.61	3- 4.1	1.18
1- 6.5	1.60	3- 5.0	1.17
1- 6.8	1.59	3- 6.0	1.16

Age Correction Factors Continued

1- 7.1	1.58	3- 7.2	1.15
1- 7.4	1.57	3- 8.5	1.14
1- 7.8	1.56	3- 9.7	1.13
1- 8.1	1.55	3-11.0	1.12
1- 8.4	1.54	4- 0.4	1.11
1- 8.7	1.53	4- 2.1	1.10
1- 9.1	1.52	4- 3.8	1.09
1- 9.4	1.51	4- 5.6	1.08
1- 9.8	1.50	4- 7.7	1.07
1-10.1	1.49	4-10.1	1.06
1-10.5	1.48	5- 0.6	1.05
1-10.6	1.47	5- 3.6	1.04
1-11.2	1.46	5- 7.1	1.03
1-11.6	1.45	5-11.4	1.02
1-11.9	1.44	6- 5.2	1.01
2- 0.4	1.43	7- 3.5	1.00
2- 0.8	1.42	9- 7.9	1.01
2- 1.3	1.41	10- 8.3	1.02
2- 1.7	1.40	11- 4.5	1.03
2- 2.2	1.39	11-11.1	1.04
2- 2.7	1.38	12- 4.7	1.05
2- 3.2	1.37	12- 9.4	1.06
2- 3.6	1.36	13- 1.7	1.07
2- 4.1	1.35	13- 5.6	1.08
2- 4.6	1.34	13- 9.0	1.09
2- 5.1	1.33	14- 0.3	1.10
2- 5.7	1.32	14- 3.2	1.11
2- 6.2	1.31	14- 6.0	1.12
2- 6.9	1.30	14- 6.5	1.13
2- 7.5	1.29	14-10.9	1.14
2- 8.2	1.28	15- 1.2	1.15
2- 8.8	1.27	15- 3.3	1.16
2- 9.5	1.26	15- 5.4	1.17
2-10.2	1.25	15- 7.3	1.18
2-10.9	1.24	15- 9.1	1.19
2-11.6	1.23	15-10.6	1.20
3- 0.4	1.22		

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Maturity—Having reached the point of ripeness or full development as the maturity of a crop or an animal.

The end of the period which a negotiable note or other legal paper has to run becoming due.

Matzoon—See Milk and Cream Processing and Processing Equipment.

Maximum Growth Temperature—In Bact.—The highest temperature at which growth and multiplication of any given organism can take place.

Mazun—Mazzoradu—See Milk—Fermented.

Milk Sampler—A modified milk thief used for obtaining samples from cans or vats. It consists of two telescoping tubes with slits along the sides. The inner tube can be turned sufficiently to open or close the slits. When the sampler is plunged to the bottom of the can or vat, the milk or cream rushes in. Before withdrawing the tubes are turned so that they are in the closed position and the sample is carefully removed to sample bottle.

Meadow—Grassland, especially a field on which grass is grown for hay; often, a tract of low or level land producing grass which is mown for hay.

Meadow Fescue—Meal—See Feeds and Feeding.

Mealy—See Cheese Defects (Body-Cheddar).

Mealy Texture—See Butter Defects.

Meat and Bone Meal—**Meat and Bone Scraps**—**Meat Meal**—**Meat Scraps**—See Feeds and Feeding.

Mechanical Analysis (Soil)—See Analysis, Mechanical, of a Soil.

Mechanical Efficiency—As applied to an engine, it is the ratio of the useful horse-power available at the flywheel or power takeoff of the pressure horse-power developed in the engine cylinders.

Mechanical Equivalent of Heat—778.2 ft. lb. of work are equivalent to 1 British Thermal Unit.

(778.2 ft. lb. = 1 B.t.u.)

Mechanical Holes (Cheese)—**Mechanical Openness** or **Mechanical Openings**—See Cheese Defects. (Texture).

Mechanical Refrigeration (Ice Cream)—This type of refrigeration uses a complete refrigeration system with the expansion coils cooling the packer. These packers are similar to storage rooms, and are mainly truck bodies for trucking large volumes and for hauls as long as 48 hours.

Mecklenburg Skim—See Cheese.

Media—Any nutrient materials used in the laboratory for the growth and cultivation of microorganisms.

Media for Yeasts and Molds—Chiefly potato dextrose agar which has had the pH reduced to 3.5. This media discourages the growth of bacteria and allows the yeast and molds to develop.

"Mediterranean Fever"—A disease now called Brucellosis. See Brucellosis.

Medium Close Cheese—**Medium Colored Cheese**—See Cheese.

Meiosis—The process in gametogenesis in which the chromosomes are reduced from the diploid to the haploid number. The two cell divisions in this process are termed the reduction and equational divisions.

Mellowing—See Cheese.

Melrol (Borden's)—Wrapped individual servings of ice cream.

Meltability—See Cheese.

Melting Point—The temperature at which a solid substance begins to melt when under standard pressure.

Melting Test—**Meltdown Test**—See Daily Tests.

Melun, Brie de Melun—See Cheese.

Membrane, Fat Globules—The fat globules seem to be surrounded by an adsorption membrane consisting of lipide, but principally lecithin and a protein that differs in composition from other milk proteins. This membrane is practically removed during the churning process of cream but it is found in buttermilk.

Mendel's Laws—The basic laws of inheritance discovered by Gregor Mendel, an Austrian monk (1822-84), in breeding experiments with peas. He showed that characteristics such as height, seed color and shape, etc. are determined by discrete factors (called genes) which exist in pairs. The first law (of segregation) states that members of a gene pair separate in gamete formation, each egg or sperm receiving one member of each such pair. The second law (of independent assortment) states that the manner in which one gene pair is assorted between gametes does not influence the manner in which other pairs of genes segregate. (The latter law has since been modified to take into account the fact that whole blocks of genes tend to be passed on as units because of grouping of genes on chromosomes which also tend to be inherited as discrete bodies.)

Mercuric Chloride—See Corrosive Sublimate.

Meringue—A mixture of beaten egg whites and sugar, in the proportion of 6 egg whites to one pound of sugar. Used for decorating ice cream, pies, cakes, and puddings.

Merrell-Merrell-Gere Process—See Milk, Processing and Processing Equipment.

Mesa—A flat-topped hill, with abrupt or steeply sloping sides such as are common in southwestern United States.

Mesitra Cheese—See Cheese.

Mesophilic Bacteria—Moderation loving Bacteria which grow well at moderate temperature ranging from 25°C. to 40°C (77°F to 104°F) include most of the common bacteria found in milk.

Mesquite and Tornillo—See Feeds and Feeding

Metabolism—A way of living in which one species of bacteria so conditions or prepares the medium in which it lives that a following species will grow and flourish in it. Ex The ripening of cheese which is most often due to a succession of different organisms each performing its part in the ripening process.

Metabolism—The chemical change proceeding continually in living cells by means of which energy is provided and new protoplasm is built up.

The sum of the processes concerned in the building up of protoplasm and its destruction incidental to life; the chemical changes in living cells by which the energy is provided for the vital processes and activities and new material is assimilated to repair the waste.

Metabolizable Energy—That part of the gross energy of a feed which is not carried off in the urine, feces or gases. It is the energy that is available for use by the body in carrying on the work of digestion, external work, growth and reproduction and production of fat, milk, wool, etc. See Gross and Net Energy.

Metabolized Vitamin D Milk—Milk produced from cows fed irradiated yeast. Irradiated yeast contains a high percentage of ergosterol and produces an abundant source of vitamin D. In order to produce vitamin D milk the amount of irradiated yeast to be fed is based on the amount of milk produced by the cow and the yeast must be fed at least twice a day to cows just before each milking.

Meta-Casein—Same as Para-Casein.

Metal Coefficients of Linear Expansion—See Reference Section in Handbook, P. 326.

Metallic Flavor—See Milk & Cream Defects and Butter Defects.

Metals—(in dairy equipment)—Dairy engineers suggest stainless steel as the most satisfactory metal for nearly all dairy equipment. It should also be used for tanks. If this metal is not available or is

too expensive, tinned copper is used but this is not recommended because as soon as tin wears off the exposed copper will cause oxidized flavors in the milk or other dairy product.

Meter—A measure of length the basis of the metric system. Metric unit of length equal to 39.37 inches or 3280.8 feet or 1493.0 yards. One centimeter is 1/100 meter and one millimeter is 1/1000 meter. See Handbook Reference Tables.

Methionine— $\text{CH}_3\text{S-CH}_2\text{CH}_2\text{CH}(\text{NH}_2)\text{CO-OH}$ —An amino acid found in the proteins of milk. Casein contains about 2.8 gms per 100 gms. B lactoglobulin about 3.2 gms per 100 gms.

Methoxychlor (Fly Spray)—The fly spray most generally recommended for use on dairy cattle in barns and in milk houses. It is a residual spray. It will be effective on cattle from 3 to 5 weeks and for a much longer period in the barn. Three applications should be sufficient to take care of the barn all summer.

This insecticide is poisonous and should be used with precaution. Cover the manure and water cups whenever the barn is sprayed and protect all feed from the spray. Since it appears that a trace of methoxychlor shows up in the milk of sprayed cows the U. S. Public Health Service has raised a question as to the propriety of using this spray on milk-producing cows. Though the author has seen no mention of ill effects from the use of such milk, pending further investigation, the Food and Drug Administration has made no ruling against its use.

Methyl Chloride—A common refrigerant. It is non-corrosive to all ordinary materials and does not hydrolyze into corrosive compounds. It is well adapted as a refrigerant in equipment having a capacity up to 10 tons and has no injurious effect upon luscious flowers or food products.

Methyl Red Test—A specific biochemical test chiefly used to differentiate *Escherichia coli* from *A. aerogenes*. The test involves relatively high amounts of acid by *Escherichia coli*.

Methylene Blue Reduction Method (Reductase Test)—See Dairy Tests.

Metric Ton—2204.6 lb (1000 kg)—See Weights and Measures in Reference section.

Mho—The conductance of a body through which one ampere of current flows when the potential difference is one volt. See Conductance.

Micelle—A particle of dispersed phase in a colloidal dispersion.

Micelles of Casein—Units of structure built up from complex molecules in colloids which interlock to form a network and which are capable of increase or decrease in size without change in chemical nature. In hard curd milk, due to the greater amount of casein giving more coagulating centers, the network is more compact and contains less water. In soft curd milk the opposite effect takes place.

Michigan Farm Cheese—See Cheese.

Microbe—A term usually applied to disease producing organisms; may be of either vegetable (bacterial) or animal (protozoan) origin. A minute organism, not visible to the naked eye. A germ. Same as micro-organism.

Microbiology—The science that deals with the study of microscopic (minute) organisms in both the vegetable and animal kingdoms. Some of these microorganisms are very necessary to normal development of man and other higher animals and plants; others produce diseases. See Dairy Microbiology.

Micrococci—Round forms of bacteria occurring singly.

Micron—A unit of measure used for microscopic objects; 1/1,000 of a millimeter or 1/25,000 of an inch.

Microorganism—Any organism too small to be seen without the aid of a microscope.

Microscopic—That which is visible only with the aid of a microscope.

Microscopic Colony Count (Little Plate Method)—See Dairy Tests.

Microscopic Count of Bacteria (Direct)—A method of counting bacteria in milk by direct microscopic examination of a dried film of milk. On a clean glass slide .01 cc. of milk or cream is deposited by means of a capillary pipette. The milk is then spread over an area of 1 sq. cm., dried, stained and examined. This method has many advantages but it cannot be used for pasteurized milk and is not practical for low count milk. Also called Breed Count.

Microscopic Examination—See Microscopic Count of Bacteria.

Middlings—See Feeds and Feeding.

Midgets—Picnic—Junior Twin—Commodore—See Cheese.

M.I.F.—Milk Industry Foundation, Washington, D. C.

Mignot Cheese—See Cheese.

Mignot-Plumey Milk Dryer—See Milk, Processing and Processing Equipment.

Mil, Circular—Area of a circle .001 inch in diameter, equal to .0000007854 square inches. Unit used in the measurement of diameters and cross-sectional areas of wires.

Milano—(Stracchina di Milano, Fresco, Quardo, Stracchino, Quartirolo—Various names given to the Milano cheese)—See Cheese.

Milch—Giving milk, referring to domestic animals only, as milch cow; one kept for her milk, more commonly—milk cow.

Mild Cheese—See Cheese.

Mildew—The common name for certain types of fungi and for the diseases they cause in plants. There are two types, the powdery mildew and the downy mildew.

Mile—A measure of length, equal to 5280 feet or 1609.34 meters.

Milei—A German food product made from dairy residues of skim milk and whey, which may be used in cooking and baking.

MILK AND CREAM

Milk—A white or yellowish fluid secreted by the mammary glands of female mammals for the nourishment of their young. It consists of small globules of fat suspended in a solution composed chiefly of casein and other protein matter, milk sugar and inorganic salts. That secreted before parturition and for some days thereafter is called colostrum.

According to U.S. Standards, "Milk is the whole, fresh, clean, lacteal secretion obtained by the complete milking of one or more healthy cows, excluding that obtained within 15 days before and 5 days after calving, or such longer period as may be necessary to render the milk practically colostrum free. The name 'milk' unqualified means cow's milk."

Van Slyke gives the average gross composition of 5,552 analyses as follows: Fat 3.9%, Albumin 7%, Casein 2.5%, Lactose 3.1%, Mineral matter 7%

In addition to market milk, the principal food products made directly from milk are butter, cheese, cream, evaporated and condensed milk.

Of the by-products of milk the most important commercially are most of the powdered milks, skim milk, buttermilk, ice cream and whey.

Blended Milk (U.S.D.A. Standards)—Blended milk is milk modified in its composition so as to have a definite and stated percentage of one or more of its constituents.

Block Milk—A term generally given to a sweetened condensed milk in semi-solid form manufactured for army rations and for confectionery manufacturing purposes.

For details see "By-products From Milk" by Whittier & Webb.

Buttermilk—The by-product that remains when fat is removed from milk or cream, sweet or sour, by the churning process. It contains at least 8.5% of milk solids, not fat. Also called natural or genuine buttermilk.

Average Composition	From sweet cream	From sour cream
Water	90.95%	91.61%
Fat	.35%	.50%
Casein		
Albumin	3.51%	3.30%
Milk sugar	4.42%	3.40%
Lactic acid	.91%	.50%
Mineral matter	.73%	.65%

Buttermilk, Cultured—is prepared by pasteurizing milk at a temperature of approximately 185°F for 30 minutes and then adding a starter (a mixture of bacteria that will produce the desired flavor and quantity of lactic acid). The milk is held at approximately 72°F until sufficient acid has developed, then stirred to break up the curd. Generally a small amount of cream is added, approximately between 1 and 2% of fat. This greatly improves the flavor. To more closely imitate natural buttermilk, some makers add a small amount of melted butter which is sometimes sprayed into the product. Some prefer to add a small amount of milk or cream that has been churned until small butter particles appear.

Buttermilk or "cultured buttermilk" drinks are very good and popular with many people.

The following methods are used in preparing cultured buttermilk.

Churned cream—A cultured buttermilk prepared in the customary manner, to which are added small butter particles. These particles are made by whipping a 30% cream until butter pellets about the size of a pin head appear. A sufficient quantity of the pellets is added to make the product appear like old-fashioned buttermilk.

Flake—A cultured buttermilk in which artificially colored particles of melted butterfat have been dispersed so that they appear as small golden yellow particles distributed in irregular suspension through the liquid. This buttermilk may be made by a churning process in which the butter milk is churned with small quantities of butter or by the spray (Vogt) method in which a mixture of water and milk fat is sprayed directly onto the surface of the cold buttermilk which is being constantly agitated or by the pellet method.

Pellet Method—A method for preparing commercial cultured buttermilk. Butter fat is melted and poured in a trough which has small perforated holes. The butter oil is allowed to drip drop by drop, over the vat of cultured buttermilk which is prepared in the ordinary manner. The vat agitator is set in motion and allowed to operate as the butter oil drips in the cold buttermilk. As the drops of melted oil strike the cold milk they immediately flatten and solidify. This flattening effect appears highly beneficial in maintaining a well suspended and even distribution of the globules throughout the body of the buttermilk with little tendency towards floating to the surface. This procedure is also known as the Drop Method.

Vogt Method—See Flake Buttermilk.

Buttermilk, Condensed—Creamery butter milk which has been ripened to an acidity of 1—1.8% and then condensed at a ratio of approximately 3 to 3½ lb of buttermilk to one pound of the condensed product. Condensed buttermilk is a valuable feed for hogs and poultry. It contains approximately 28% total solids. The annual production of condensed butter milk in the United States is about 110,000,000 lb. See Semi-solid Buttermilk.

Composition of Water 65-70%, Protein 10.5-14%, Fat 0.3-2.0%, Lactose 15-18%, Mineral Matter 2.1-2.8%, Lactic Acid 4.5-6.0%.

Buttermilk Powder—Also called Dry Butter milk. From this most of the water has

been removed by heat or vacuum process used by bakers; also for livestock feeding.

The approximate composition is as follows: Water, 1.93%; Protein, 33.74%; Fat, 5.87%; Lactose, 39.91%; Mineral Matter 7.68%; Lactic Acid, 5.87%.

Buttermilk, Semi-Solid—Buttermilk which has been ripened to an acidity of about 1.6% to 2.0%, then heated and condensed in vacuum pans until it reaches a concentration of from 3:1 to 4:1. It is packed in barrels and sold as hog and chicken feed. A smaller proportion is sold to bakeries, confectioneries, and various food manufacturers. The ingredients of the product are:

Water, 65-70%; Fat, 0.3-2.0%; Protein, 10.5-14.0%; Milk sugar, 15-18%; Acid 4.5-6.0%; Mineral Matter, 2.1-2.8%.

Canned Milk—A term commonly used to mean sweetened, condensed, sterile fluid or evaporated milk sold in metal cans. It will keep for long periods without refrigeration.

Certified Milk—A special grade of milk, usually raw, produced under the supervision of a medical milk commission which lays down and enforces rules for its production. Among the requirements are strict cleanliness of cows and stables, tuberculin and Bang tested cows, regular physical examination of employees, bacteria count of milk not to exceed 10,000 colonies per cc., and a special bottle cap. Formerly, all certified milk was sold raw but now much of it is pasteurized. Because of increased cost of production, certified milk is much higher in price than ordinary market milk.

Certified Milk—Pasteurized—Certified raw milk which has been pasteurized, cooled, and bottled in a milk plant conforming with the requirements for Grade A Pasteurized Milk. See Milk Classification.

Chocolate Milk—A popular milk drink made from skim milk, partially skimmed milk, whole milk or reconstituted milk and flavored with cocoa or chocolate and sugar—a little salt and vanilla or spice may be used for added flavor effect. The product should be pleasing to taste, be of a medium brown color and of smooth, full bodied consistency but not thick or curdled in appearance, and should preferably be free of visible creamline and sediment when bottled for retail. Many dairies in all parts of the United States make and sell

chocolate milk or chocolate drink as a regular service to their customers.

Most states have legal requirements for the composition of chocolate milk, some requiring it to be made from whole milk, others with a minimum of 2% milk fat. In most cases the 2% or lower fat content product is labeled Chocolate Drink while the richer product is called Chocolate Milk.

Since the most important qualities of milk drinks are Flavor, Stability and Appearance the *milk* used as the base, whether it be whole, skim or partly skimmed, should be fresh and of good flavor. If reconstituted milk is the base it is best to use a low-heat milk powder with water and sweet cream. Condensed skim milk, water and cream, or sweetened condensed milk, water and cream can also be used. The water used should be pure—free from odors or foreign flavors such as chlorine, sulfur or iron—to prevent off flavors in the chocolate product.

Cocoa is more often used as a flavoring material but liquor chocolate is used and either one should be of best quality and flavor. Sugar, flavor and stabilizer are added to the cocoa to make a powder which may be added directly to the milk or mixed with water to make a syrup.

Stabilizers are used to raise the viscosity of the milk thus holding the cocoa particles in a state of suspension and preventing them from settling out. They also give added body to the product. The stabilizer most commonly used is sodium alginate but gelatin and carrageen (Irish Moss) are also used. The amount used should be such as not to cause the product to be thick or look soured.

Chocolate syrups and powders are prepared commercially but may be made in the dairy plant usually at less cost. To make a syrup for use in chocolate milk containing 1% cocoa, 5% sugar and 0.2% sodium alginate, these three ingredients are weighed out in the given proportions: Then, mix the 0.2 part sodium alginate thoroughly with 1 part (1/5 of the sugar) sugar, and the 1 part cocoa with the remaining 4 parts of sugar. Add slowly 4 parts water (or milk) to the cocoa and sugar mixture, stirring until the syrup is smooth. Heat to 150°F. and then add the alginate sugar mixture gradually while stirring. Heat this syrup to between 180 and 190°F., hold for 15 minutes, then cool quickly to below 50°F. at which temperature it should be kept until used. Sweet skim milk may be used in place of

water in making the syrup. Although this lowers its keeping quality it adds to the non-fat solids of the finished product.

Formula for 100 gallons of Chocolate Milk:
90 gallons of sweet milk of whatever per cent of milk fat is legal
10 gallons of chocolate syrup

The milk whole partially skimmed or skim is heated to 140-145°F and homogenized at 1500 to 2000 pounds pressure (this prevents cream rising) and should always be done before syrup or dry ingredients are added. The prepared syrup is then thoroughly mixed with the milk and the mixture held for 30 minutes at the above temperature. The product is then cooled rapidly and bottled and held at 50°F or less until used.

Instead of using the syrup method the dry ingredients may be added directly to the milk as follows: Mix one part cocoa with an equal weight of sugar and add to 90 parts homogenized milk, heat to 150°F stirring continually. Add gradually to 0.2 part sodium alginate mixed with 5 times its weight of sugar and stir gradually. Then add the remaining 3 parts of sugar. Heat the mixture to 145-150°F for 30 minutes and cool rapidly. Bottle and refrigerate below 50°F until used.

Classification Price Plan, Milk.—A dealer's plan for buying milk, in which the price paid varies with the use to which the milk is put. There are always two classes of milk under this plan and in many markets there are four. The first class consists of all milk sold by the distributor in fluid form while the remaining class or classes consist of milk used for cream or for manufacture into surplus products. This plan is used in many large markets. Class I price is always higher than Class II price per cwt. Also called Milk Utilization Plan or Surplus Milk Plan.

Composition of Milk.—See Reference Section P 285

Composition of Colostrum Milk

	Immediately	Time after Calving			
		After 10 hrs	After 24 hrs	After 48 hrs	After 72 hrs
Sp. Cr.	1.008	1.046	1.045	1.042	1.052
Water %	73.07	78.77	80.63	80.81	86.64
Fat %	3.54	4.66	4.73	4.21	4.04
Casein %	2.65	4.28	4.39	3.25	3.33
Albumin %	16.56	9.32	6.25	2.31	1.03
Sugar %	3.00	1.42	2.82	3.46	4.10
Mineral					
Matter %	1.18	1.55	1.02	.96	.82
Total Solids %	26.93	21.23	19.37	14.19	13.36

Concentrated Milk.—A general term which includes any form of fluid milk product which has been concentrated by the removal of water.

Concentrated Milk, Frozen.—Milk from which about 50 or 60% of the water has been removed before freezing. Iowa State College has recently developed a new process for making frozen concentrate milk. During the process the milk is pasteurized, homogenized, condensed, homogenized again, canned, heat-treated and then frozen.

The developers claim that the fresh frozen milk will keep perfectly for two weeks at a temperature under 40°F. For a longer time storage it is kept in a freezer at 20°F below zero or colder. Thus treated the researchers say it will keep for three months.

Concentrated Liquid Milk.—Milk from which water has been evaporated to the extent that it is reduced in weight about 3 to 1. It is generally homogenized and pasteurized after condensation and then bottled and marketed in a manner similar to fluid bottled milk. It has good keeping qualities, takes up less space; is more economical to handle due to reduction in water and can be reconstituted to any desired degree by the user. It is identical with plain condensed whole milk except for its method of packaging.

Concentrated Skim Milk.—See Plain Condensed Milk.

Concentrated Sour Skim Milk.—Skim milk which has been pasteurized by continuous process at a temperature of about 178°F. Holding process can also be used. When the milk is cooled to about 115°F, 2% of starter is added and stirred to insure even distribution. It is allowed to ripen until about 2% of acid has been developed. A bulgaricus type of culture and a mycoderma is used. After ripening the product is concentrated about 3 to 1, resulting in a heavy semi-solid product after cooling. It is used for poultry feeding largely and because of the high acid will keep indefinitely.

Condensed Milk (whole & skim).—Milk concentrated by removing water with or without the addition of sugar for preservation. There are three general types of condensed milk: 1) Plain condensed, 2) Sweetened condensed when sugar is added for preserving purposes, 3) Superheated con-

densed milk which is thickened by a heat treatment after water removal.

Condensed Milk, Plain, (whole or skim)—Milk which has been concentrated 3 to 1 or more without any addition of sugar or further processing except cooling. It is usually packaged in 10 gallon milk cans and used in ice cream or by the baking or confectionery industries.

Condensed Milk, Superheated, (whole or skim)—Similar to plain condensed milk except that it is thickened by a heat process after removal of water. A heat coagulation of calcium caseinate results which yields a thick smooth liquid on agitation. It is used in ice cream to compensate for stabilizer omission and also in the baking and confectionery industries where heavy body and water binding properties are desired.

Condensed Milk, Sweetened—Cow's milk, condensed at a ratio of from 2 1/3 to 2 3/4 parts fresh milk to 1 part condensed milk and containing from 40 to 45% sucrose as a preservative. It contains not less than 28% milk solids and not less than 8% milk fat. Properly made sweetened condensed milk is of semi-fluid consistency and will keep for many months. It is packaged in 12-14 oz. tins or in bulk containers such as large cans or barrels.

Composition

	% Water	% Protein	% Fat	% Lactose	% Sucrose	% Mineral Matter
Max.	29.57	8.49	10.17	15.76	43.22	2.08
Min.	23.01	7.27	8.5	12.01	39.44	1.56
Ave.	27.03	7.83	8.99	12.65	41.65	1.76

Condensed Milk, Unsweetened—Condensed milk to which no sugar has been added. See Evaporated Milk, Plain Condensed Milk, Concentrated Milk.

Condensed Blend—A condensed milk product blended with cream containing approximately 18% butterfat and 20% milk solids-not-fat. It is used largely by restaurants as a coffee cream or table cream product.

Condensed Skim Milk (U.S.D.A. Standard)—"Condensed skim milk (plain condensed skim milk, evaporated skim milk, concentrated skim milk) is the product resulting

from the evaporation of a considerable portion of the water from skim milk, and contains not less than 20% of milk solids." See Plain Condensed Milk.

Condensed Skim Milk, Sweetened, (U.S. Standards)—Sweetened condensed skim milk (sweetened evaporated skim milk, sweetened concentrated skim milk) is the product resulting from the evaporation of a considerable portion of the water from skimmed milk to which sugar (sucrose) has been added. It contains not less than 24% milk solids, plus 40%-46% sugar.

Composition

Sample No.	% Water	% Protein	% Fat	% Lactose	% Sucrose	% Mineral Matter
1	28.60	8.29	0.67	12.36	48.22	1.86
2	28.34	8.36	0.86	13.28	47.45	1.71
3	30.16	10.03	1.67	15.06	42.77	2.34

Milk Solids legal limit 24%

Constituents of Milk—See Reference Section, P. 283.

Cow's Milk, Composition (Average)

Major Breed	Fat %	Total Solids %	S.N.F. %	Parts of Fat 100 parts Total Solids
Holstein	3.45	12.29	8.84	28.0
Ayrshire	3.85	12.98	9.15	29.6
Brown Swiss	3.91	13.28	9.57	29.4
Guernsey	4.92	14.20	9.22	35.0
Jersey	5.14	14.90	9.76	34.5

CREAM

The sweet, fatty liquid or semi-liquid separated from milk, with or without the addition thereto of sweet milk or sweet skim milk. It contains not less than 18% of milk fat.

Cream might be loosely defined as rich milk. Because it is a concentration of fat globules in the milk it is lighter than milk. Commercial cream usually tests between 18-40% butterfat and is usually obtained by centrifugal separation.

Artificial Cream—According to recent Pure Food terminology, artificial cream is a food article made up of milk ingredients to which water has been added to make a product resembling naturally produced cream.

Avoset—A trade name for a sterilized cream of 20% to 30% fat content. The fat emulsion is stabilized with an alginate and some corn product is also added. The

combined amount of these two added products does not exceed 0.5% (Made by Gustine Creamery Gustine California)

Canned Cream—Canned cream is made of varying composition 20% to 30% butterfat content. The fat emulsion is generally stabilized the amount of stabilizer used being about 0.3%. This product as yet is not very extensively used in this country but seems to be more popular in European countries.

Cereal Cream—A very light commercial sweet cream usually testing about 10% to 12% butterfat. It is more commonly known under the name of cereal milk but is sold in a number of markets as Half n Half.

Clotted Cream—Cream prepared by a process of scalding and cooling which results in a thick heavy clotted substance used chiefly in place of butter. Also Evaporated Cream.

Coffee Cream—Cream used in coffee. This cream is usually homogenized and tests about 20% butterfat. See Cream Standards. Also called single cream, table cream or homogenized cream if it has been homogenized. Roadhouse & Henderson suggest the following features for desirable table or coffee cream:

- 1 Fat content 20 to 25%
- 2 Maximum viscosity for a given fat percentage
- 3 No "oiling off" in hot coffee
- 4 No "leathering" in hot coffee
- 5 No cream plug formation
- 6 Minimum amount of serum or skim milk in bottom of bottle
- 7 No visible sediment
- 8 Pleasing flavor; no feed cooked or oxidized flavor
- 9 No developed acidity
- 10 Maximum ability to color coffee
- 11 Low bacteria count
- 12 Attractive package

Commercial Soured Cream (Jewish or Kasher Cream)—A ripened cream of high acidity characterized by a clean flavor, smooth texture and very heavy body. The product has an acidity of about 0.6% to 0.8% which is derived from a commercial starter. It is in greatest demand by Jewish, German, Slavic, and other foreign peoples. It may be used as a dressing with cottage cheese, salads and fruits as a sandwich spread and in various other ways. After standardizing the cream to at least 19%

fat, pasteurize at not under 180°F for not less than 10 minutes and preferably 30 minutes. Homogenize or viscolize at this temperature and under a pressure of not less than 2000 lb. Cool to 70°F and add an amount of starter which will ripen the product to an acidity of about 0.6%-0.8% in the time desired. Rennet may be used or extra solids may be added to increase the body. Package with a minimum of agitation, cool to 40°F or lower and age for 12 to 24 hours prior to marketing.

Cornish Cream—See Devonshire Cream.

Cream, 80%—See Plastic Cream.

Cream Powder—A product containing 50% or more of fat but since there are no legal requirements dried cream may be made from enriched milk containing only 9 to 10% of fat.

The ratio between the fat and solids-not-fat is that of cream previous to drying.

Composition

Sample No.	Water %	Protein %	Fat %	Lactose %	Mineral Matter %
1	0.89	10.19	50.40	25.45	4.16
2	0.66	13.42	63.12	17.86	2.91
3	0.56	11.1	71.15	14.4	2.43

Cream Separation in Milk—The formation of clusters of fat globules and other milk constituents which rise to the surface to form the cream layer.

Cream Standards (Federal)—**Coffee Cream**—Sweet cream containing from 18-30% milk fat.

Light Cream—Sweet cream containing from 18-30% milk fat.

Heavy Cream—Sweet cream containing not less than 36% milk fat.

Whipping Cream (light)—Sweet cream containing not less than 30% milk fat and less than 36%.

Whipping Cream (heavy)—Sweet cream containing not less than 36% milk fat—generally near 40%.

Cultured Cream—See Commercial Soured Cream.

Delshire Cream—A very rich cream differing from ordinary cream only in the degree of its concentration. It contains from 60 to 70% butterfat. It is almost as rich in butterfat as is butter which legally must contain not less than 80% butterfat. It is made by running milk warm from the cows or cold milk heated to 100°F., through a cream separator having special

parts for skimming heavy cream. It can be used as a spread, as cream or in place of other fats in cooking and baking. Similar to Plastic Cream.

Devonshire Cream (Cornish Cream)—A rich cream, similar in many ways to plastic cream. It originated in England and is used as a spread. Milk is placed in a shallow pan on the stove and allowed to simmer, but not to boil. The clotted cream is then skimmed off, cooled, and placed in tin containers. It has a heated nutty flavor.

Preparation—

Pour a qt. of rich, fresh milk into a small double boiler and keep cold for about 12 hours to allow most of the cream to rise. Next gradually raise the temperature to about 180°F., being careful not to disturb the cream in any way. The temperature must be raised very slowly, averaging about 2° per minute. Keep hot for a number of hours, or until a stiff crusty layer of cream is formed, and then cool. Remove cream with a flat perforated skimmer. This cream has a very delicious flavor and is often eaten with bread, either sweetened or unsweetened.

Evaporated Cream—Condensed cream containing no added sucrose. It is sterilized in hermetically sealed cans. Also known as Clotted Cream. Similar to Devonshire Cream.

Frozen Cream—Sweet cream which has been frozen and held at low temperatures for later use in dairy manufacturing. Because ice cream is largely consumed during hot weather and on special holidays, many ice cream manufacturers follow the practice of buying at low price during surplus months of good quality cream and storing it as frozen cream until needed. Good quality fresh cream, which tests at least 40% fat and has been pasteurized, should be used. It is usually stored in straight-sided tins of from 50 to 60 lb. capacity or in fiber containers and kept at a temperature of from -10° to 0°F. These containers should have no exposed iron or copper.

Gravity Cream—Cream obtained either by the "shallow pan system" or by the "deep-setting system." If by the former system, the milk is placed in pans from 2 to 4 inches deep and kept at a temperature of 60°F., avoiding as far as possible contamination by bacteria. The cream is then skimmed off, leaving a skim milk con-

taining from 0.5 to 1% fat. Better results are obtained by the deepsetting system. Shotgun cans of 4-gallon capacity are filled with milk and kept at 55°F. or below. The cream separates in about 24 hours and is then skimmed off, or the skim milk is drained off if the can is equipped with a faucet at the bottom. The skim milk may contain as little as 0.2% fat. Quite generally used before the day of the separator, but now obsolete.

Heavy Cream—See Cream Standards.

Honey Cream—A mixture of high testing sweet cream (Dulshire cream or Plastic cream) and extracted honey. A cream testing 70 to 80% fat is separated from warm sweet milk. This is immediately mixed with honey, a mixture of 42% of honey and 58% of cream being recommended. Although perishable, honey cream can be kept for about 2 weeks at temperatures below 40°F. Honey cream is used as a spread on bread, biscuits, waffles, etc.

Light Cream—See Cream Standards.

Plastic Cream—A highly concentrated cream containing about 80% fat. It is plastic in form, much the same as butter. In spite of its high fat concentration, the fat remains in substantially its original emulsion with the solids-not-fat present in the serum. Plastic cream is produced commercially by the use of a separator designed for skimming a very rich cream. Either whole sweet milk or sweet cream testing 40% fat or less may be used. After separating, the cream is quickly cooled and packaged in 60-lb. butter tubs. Plastic Cream is used in the manufacture of butter, ice cream, coffee cream, cream cheese and other dairy products.

Pream (Trade-name)—A powdered formula of light cream, skim milk (calcium reduced) and lactose. An all-dairy product which dissolves instantly in hot fluids.

Reconstructed Cream—A product made by combining unsalted butter and fresh skim milk by passing them through a homogenizer or emulsifier at high temperature. This mixture is often sold as fresh cream, but such a practice should not be tolerated. Milk may also be reconstructed in a similar fashion.

Rejuvenated Cream—Sour cream which has been neutralized, mixed with fresh skim milk and then reseparated. In this way the skim milk will partly replace the

soured serum of the original cream and the fermented flavor will be less evident. This practice is not recommended and is not carried out by ethical dealers.

Sour Cream—See Commercial Soured Cream.

Supreme Cream—See Plastic Cream.

Sweet Cream (U.S. Standards)—That portion of milk rich in milk fat which rises to the surface of milk on standing or is separated from it by centrifugal force. It is fresh and clean containing not less than 18% of milk fat and not more than 0.2% of acid-reacting substances calculated in terms of lactic acid.

Synthetic Cream—A product made of non-milk fats such as cotton-seed oil, peanut oil, certain ingredients of soy bean to which lecithin and other ingredients have been added. It is generally advertised under a trade name and is used as a substitute for cream.

Vacreated Cream—Cream that has been subjected to vacreation which consists of (1) flash pasteurization by direct contact of the cream particles with steam of adjusted temperature in low vacuum; (2) removal of extraneous objectionable flavor by steam distillation in intermediate vacuum; and (3) cooling and toning of the cream in high vacuum.

A special type of pasteurizer known as a vacreator is used and cream thus treated is said by the manufacturers to make butter of a quality superior to that made from cream which has not been subjected to such treatment.

Whipping Cream—A grade of market cream especially adapted for whipping in the open air. Whipping cream should contain from 32% to 40% butter fat and should be aged for at least 24 hours at a temperature of from 40° to 50°F to increase clumping of fat globules. Rapid agitation of whipper is important for best results.

DEFECTS

Condensed, Evaporated and Powdered Milks

Bloats—A term used to designate swelled cans of evaporated milk.

Blown Evaporated Milk—Swelled cans of evaporated milk. The swelling or bulging may result from transferring the filled

cans to locations higher in altitude than the location of the factory at which the cans were filled. High temperatures at high altitudes intensify this condition if milk was cold when cans were filled. Blown cans may also be caused by chemical action by freezing and by bacterial action.

Browning—One of the defects in concentrated milk which is generally caused by too intense heat during the forewarming and also by high storage temperatures.

Buttons (white yellow or reilbrown)—A defect of sweetened condensed milk. It consists of the appearance of lumps of firm cheesy curd usually on the surface of the liquid. The buttons increase with storage temperature and age. They are white to yellow or reil brown in color. They appear most frequently in cans that have been stored a long time. The cause is the growth of the mold *Aspergillus repens* and perhaps other molds. The mold may die after it uses up all the oxygen in the can but the button itself is probably due to enzyme action continued after the death of the mold. Buttons may be prevented by exclusion of contamination, exclusion of oxygen and storage at low temperature.

Caking—A defect of milk powder caused by excessive fineness and flakiness. The rapid absorption of water by the powder causes it to lump together forming a paste coating around the remainder of the powder, retarding penetration by water and making complete solution slower. The defect is generally experienced less with film process milk powders than with the finer spray process powders. Coarser sprays caused by lowering pressure increasing the orifice in the spray nozzle and increasing condensation before spraying are used in correcting the defects thus producing powder of greater miscibility. It is held that when particles are less than 75 microns in diameter they cause caking and retard solution. An average diameter of 150 microns is considered the most desirable degree of fineness.

Grainy Sediment—A defect of evaporated milk in the form of a gritty granular deposit consisting of salts of calcium and magnesium. It is white in color and is soluble non-crystalline in character. The amount which occurs depends on the nature of the milk manufacture and storage.

Putrid Flavor—With age sweetened condensed milk gradually develops a stale flavor which often develops into a putrid

odor and flavor. This defect seldom occurs when the fresh milk has been heated to 180°F. or higher. The defect is probably caused by the active enzymes in milk gradually decomposing the proteids. Heating the milk to 176°F. or higher destroys the action of most of these enzymes.

Rancid Flavor—A rather infrequent defect of sweetened condensed milk, which usually makes the product unfit for food. When sweetened condensed milk is thus affected, it has the flavor and odor of butyric acid. It is due to the liberation, by hydrolysis, of butyric acid and other fatty acids. This in turn is caused by insufficient heating to destroy totally the lipase enzyme found in all raw milk.

Rough Texture—A defect of sweetened condensed milk whereby part of the milk sugar has been precipitated into many crystals large enough to grit between the teeth. The crystals are also noticeable to the eye, and the condition gives the appearance of candied milk. Also known as **Sandy or Gritty Texture**.

Sandy Texture—A defect of sweetened condensed milk caused by sugar crystals large enough to prevent a smooth, velvety texture which is characteristic of good quality sweetened condensed milk. It causes the product to be coarse and gritty. Although this condition does not harm the wholesomeness of the product, it does show that the product has not been handled properly and is objected to by the trade.

Separated and Churned Texture—A common defect of evaporated milk. Lumps of cream or of churned butter appear on the top of the product. This condition does not alter the wholesomeness of the product but does affect the appearance. The fat globules, because they are lighter than the serum, tend to rise to the surface. Agitation to which the separated evaporated milk is subjected during transportation causes the cream to churn into lumps of butter. More efficient homogenization, higher viscosity and periodic turning of cans will help to prevent this undesirable condition.

Swell Heads—Cans of condensed evaporated or other supposedly sterile milk, the contents of which have undergone gaseous fermentation. The resulting pressure causes the ends of the cans to bulge or swell, and frequently to burst open along the seams. Also called **Bloats**.

Thickened Sweetened Condensed Milk—A defect which is caused by aging sweetened condensed milk. Progressive thickening with age, to the point of becoming too viscous for pouring, makes the product objectionable and unsalable.

Milk and Cream

Barny Flavor—A flavor suggestive of contamination with manure and stable air. It may be due to the actual contamination of milk with manure or more likely to cows being housed in unventilated stables where the air is strongly tainted with barny odors. In such cases the cows breathe in the tainted air, the blood picks up the substances from the lungs and some find their way to the secreting cells of the udder. The flavor is actually secreted in the milk. Barny flavor is more common in cold weather when the stables are closed up for warmth. Lack of proper cleaning of stables is a factor. This flavor may be present in milk, cream, butter, cheese or ice cream.

Bitter Flavor—An off-flavor of milk and milk products which may result from several different causes, the most common probably being bacterial action and the eating of certain feeds and bitter weeds by the cows. Milk from cows advanced in lactation is often bitter as a result of a high lipase content and rancidity. In butter, bitterness may be brought about by the presence of impurities in the salt, or by yeasty cream, in addition to the previously mentioned causes. Calcium chloride brine leaks may be responsible for a bitter flavor at times. Not easily detected by sense of smell but rather pronounced to taste, the flavor lasts for sometime after the sample has been expelled from the mouth.

Bitter Milk—A common type of abnormal milk which may be due to some feed eaten by the cow or to certain unknown bacteria causing bitter milk to develop on standing. Greater care as to cleanliness of production, pasteurization, and cooling is necessary to remedy this condition.

Bitterweed Flavor—A disagreeable, bitter flavor imparted to the milk of cows that have eaten bitterweed (*Helenium tenuifolium*). According to present knowledge and methods, the flavor cannot be removed from milk, but butter and cottage cheese can be washed free of the bitter component and the bitter flavor can be almost completely removed from sweetened condensed milk.

Bloody Milk—Milk appearing red, especially near the bottom of the bottle or container. This is usually due to blood which comes into the milk from a ruptured blood vessel in the udder. It is generally caused by injury to the udder. Bloody milk is also indicated when on separation the separator shows a pink or red tinge, inasmuch as the red cells are thrown out due to centrifugal force. The same is true on clarification.

Blue Milk—A very uncommon spoilment of milk caused by a bacterium, *Pseudomonas cyanogenes*. The blue color develops when milk is allowed to stand. Immediate pasteurization of the milk will prevent this condition from developing.

Paint Flavor—See Caramel Flavor.

Cappy Flavor—See Oxidized Flavor.

Caramel Flavor—A flavor defect of milk and its products, characterized by a burned or scorched taste. Generally the flavor is mild but occasionally it may be very intense. This flavor leaves no aftertaste in the mouth. It is characteristic of evaporated milk in particular and the color of the product is usually slightly browned.

Carbolic Flavor—A defect sometimes found in evaporated milk and condensed milk due to certain bacteria developing growth in the milk. This particular organism has very resistant spores requiring high heat treatment for adequate elimination.

Cardboard Flavor—See Oxidized Flavor.

Cooked Flavor—A flavor of dairy products which results from excessively high pasteurization temperatures or improper methods of heating. In the holding system of pasteurization cooked flavor is likely to occur if temperatures of 145°F. or above are used. It is thought that the flavor may be the result of changes in the sulfur combinations of protein compounds in the milk. In normal pasteurization the flavor is barely perceptible while with temperatures over 155°F. for 30 minutes or over 167°F. flash it becomes sulfidic-like due to the liberation of sulfhydryl compounds from some of the sulfur bearing proteins. The sulfhydryl fragments are antioxidants.

Cowey Flavor—This flavor conveys the suggestion of an unclean, poorly ventilated cow stable. Actually the flavor is associated with a cow ailment known as ketosis. Ketotic cows have a cowey breath, their

urine has a cowey odor and the milk which they give is definitely cowey in flavor and odor. One or more ketotic animals in a stable will impart a distinctly cowey odor to the stable air. Other animals in the herd breathing this air may also give milk with a cowey flavor.

Cream Plug—A defect of milk or cream characterized by a thick layer of buttery cream at the top so that the liquid does not pour easily from its container. It is caused by partial churning of fat globules. Therefore all causes of excessive agitation and foaming should be avoided. Sterilization is liable to cause this defect due to pressure exerted by the expanding ice crystals rupturing the fat globule membranes causing them to stick together and form small butter particles.

Curdling in Cooking Milk—A coagulation or thickening of milk on heating due to such factors as excessive acid in the milk or excessive protein content as in the case of colostrum milk.

Disinfectant Flavor—A chemical or medicinal taste and odor imparted to milk by contamination with disinfectants used on cows or in and about the stable or milk house.

Emery Flavor—A flavor defect in milk similar to oxidized flavor. A type of oxidized flavor which has been termed emery by some investigators. The term is now more or less obsolete.

Essential Oil Flavors—Essential flavors often found in milk from cows fed feed with strong flavors among which are thyme and garlic.

Failure to Whip—A term applied to cream which does not under normal whipping procedure incorporate air and form a stable foam with a fairly rigid structure.

Feathering—A defect of table cream indicating that it has not been properly processed. As a result there is some coagulation of the cream in hot coffee. A condition in which the cream forms a fairly leathery condition at the top of the cup. Cream purchasers object to this "feathering" because of its abnormal appearance. However, consumers are in error in thinking that it invariably indicates sour cream. It usually does with unhomogenized cream but with homogenized cream it is almost always the result of using excess pressure in homogenizing.

Feed Flavor—A very common defect of milk, butter and cheese. This defect is especially noticeable when cows are fed green feeds or succulent feeds such as silage, cabbage and turnip, just before milking. Even alfalfa, clover and grass when fed just prior to milking time are apt to produce an objectionable flavor in milk. Garlic, wild onion, ragweed, and leek are a few of the many weeds which cause feed flavor.

Flat Flavor—A flavor defect of milk. It is characterized by a watery taste, lacking in sweetness. It is usually attributed to low solids content or in some cases to a high chlorides/lactose ratio.

Foreign Flavor—A term used to designate flavors not normal or natural to milk or other dairy products. The flavors of gasoline, tobacco, chlorine, medications, disinfectants, etc. are classed as foreign.

Fruity Flavor—Fruity flavors in milk, butter and cheese are caused by bacterial fermentation by certain types of organisms. They are fruit-like in character, resembling pineapple, apple, pear, melon, etc.

Gassy Fermentation—The development of gas in milk or milk products through the action of microorganisms.

Garlic Flavor—See Feed Flavor.

Heated Flavor—An off-flavor, somewhat resembling the cooked flavor of pasteurized milk, found occasionally in cheese and more frequently in butter. It is caused by overheating or burning milk products used, or by too frequent use of superheated condensed milk products. It is not easy to detect because other flavors tend to obscure it.

High Acid Flavor—A flavor defect of dairy products caused by the development of excessive amounts of lactic acid in milk or cream which appears as a result of holding the product at too high a temperature for too long a period of time. High acid milk represents the first stage of sourness.

Leaky Whipped Cream—Improperly whipped cream which leaks out skim milk and water after it is whipped. Keeping the whipped cream at warm temperatures causes this condition.

Malty Flavor—An off-flavor of milk or cream. It is generally caused by the growth of a certain strain of lactic acid bacteria, *Streptococcus lactis* var. *maltigenes*.

Metallic Flavor—A common flavor defect of milk and other dairy products brought about by the individual cow, the action of copper and copper alloys in the equipment, or direct sunlight. Metallic flavors may have their origin on the farm by exposure to rusty utensils or in milk plants or creameries by exposure to copper or iron surfaces, especially when the milk is warm. The oxidative off-flavor, which if continued gives cardboard and tallowy flavors, is even more objectionable, and usually follows metallic flavor.

Musty Flavor—A relatively uncommon flavor or defect of milk. It is caused by the cow's eating musty or moldy feed, or by bacterial or mold growth in the milk itself.

It is also caused by minute contamination of milk with pine or cedar oil through particles of sawdust or shavings getting into the product.

Neutralizer Flavor—An off-flavor often appearing in a high acid cream which has been overneutralized. The tendency for this defect to appear in the products made from this cream depends on the amount of neutralizer used and the point to which the cream is neutralized. When lime or magnesia neutralizers are used, a limy, bitter flavor usually results. Soda neutralizers usually produce a soapy flavor.

"Oiling Off" (Cream Defect)—Destabilization of fat emulsion forming drops of fat on the surface of coffee. Some reasons for oiling off are: breaking of fat emulsion by partly frozen milk before separation; separation temperatures above 90°F.; mechanical agitation before separation; separation of cream testing 45% or more; holding cream warm for several hours before pasteurization; cooling cream in vats, etc. homogenization; avoiding unnecessary agitation at every stage of process; heating rapidly and flash-cooling; holding at 145°F. for 30 minutes with slow agitation and holding cream at a low temperature aid in minimizing or over-coming this defect.

Oily Flavor—A type of oxidized flavor found more particularly in butter. On further holding, butter with an oily flavor frequently becomes fishy. The term is sometimes applied to milk but "oxidized" could just as well be used.

Oxidized Flavor—A flavor defect of dairy products sometimes called metallic, capry or tallowy. Oxidized flavor usually represents the first stages of oxidation of leri-

thin or milk fat. It is more advanced than metallic flavor but not so far advanced as rancidity. Oxidized flavor is particularly common when milk has been exposed to iron, copper or copper alloys. These metals go into solution and act as catalysts in oxidation of the fat. Sunlight is also a common cause of oxidized flavor. Low temperatures and low bacterial count are often conducive to oxidized flavor. Milk is more susceptible to oxidation in the winter when cows are on dry feeds with little or no green stuffs and when the bacterial count is very low. Oxidation is definitely retarded by higher than normal pasteurization temperatures by homogenization and by condensing.

Rancidity—In the dairy industry the term rancidity applies specifically to hydrolytic rancidity. Oxidative rancidity (term used in food industry) is ordinarily spoken of as simply oxidized. A rancid flavor results when milk fats are hydrolyzed by a lipase. All mixed milk contains one or more lipases. Thus if raw milk while warm is subjected to sufficient agitation to rupture some of the fat globule membranes the lipase (water soluble) comes in contact with the fat and rancidity results. Any agitation will do this—homogenization, separation, pumping, improperly set up pipe line milkers—if vigorous enough. Pasteurization & a heat treatment will inactivate the lipase. A rancid flavor is a disagreeable butyric acid like flavor which also has bitter characteristics. It leaves an after taste in the mouth. All dairy products are subject to this defect. In butter molds frequently cause rancidity as occurs intentionally in blue cheese.

Rassalage Milk—A Swiss term for very salty milk. This type of milk is caused by more or less severe mastitic inflammation of the udder glands.

Red Milk—A red color in milk either due to the presence of blood or certain microorganisms which produce a red color. If present in milk immediately after milking it is likely due to blood. If it develops slowly later it is due to bacteria or yeast.

Ropy Milk—A type of abnormal milk characterized by a sliminess or ropiness varying in degree from a slightly increased viscosity to a ropiness so pronounced that the milk may be drawn out in threads several feet long. Ropiness is not present at milking time but develops only after the milk has been held for sometime and

is due to the formation of gums or mucins by bacteria. Many of the causative organisms are capsulated. Ropy milk is not harmful and its flavor is usually no different from that of normal milk. The organism responsible is usually picked up from improperly sanitized equipment—particularly on the farm.

Salty Flavor—A flavor defect of milk and occasionally of ice cream. Salty milk is usually due to a high chlorine and low lactose content, a condition characteristic of cows advanced in lactation or affected by mastitis.

Scorched Flavor—See Caramel Flavor.

Slime—See Separator Slime.

Separator Slime—Centrifugal separators in addition to separating cream from the milk will throw off heavy particles to the outside wall of the machine thus forming a gray viscous sediment generally called separator slime. This may accumulate to the extent that some of the openings are clogged interfering with good operation. This slime consists of bacteria, leucocytes, enzymatic substances and other protein material as well as dirt.

Composition of Separator Slime

	Richmond %	Fleischmann %
Water	66.24	68.20
Fat	50	1.44
Protein	22.00	25.34
Milk Sugar	50	1.80
Other Organic Matter	7.71	
Mineral Matter	3.01	3.21
Total Milk Solids	26.01	30.00

Serum Separation—Applied to skimmilk layer which appears in bottled cream.

Slimy Milk—See Ropy Milk.

Sludging in Homogenized Milk—A slimy deposit that occurs in homogenized milk consisting of leucocytes, epithelial cells and other foreign material that has gained entrance to the milk during production.

Soapy Flavor—Milk which has a soapy taste and which when shaken foams similarly to a soap solution. *Bacillus Saponaceus* is usually the cause of this abnormal condition.

tion. *Bacterium sapolacticum* is also capable of causing soapy milk. Both types occur on bedding and feed of cows, and are thus transmitted to milk.

Soapy Taste—Usually due to decomposition of lipides and an alkaline reaction.

Stable Flavor—See Barny Flavor.

Storage Flavor—A rather common off-flavor of dairy products. Milk products which are held in storage for a long time develop this characteristic flavor. There is a lack of freshness, especially in products of inferior quality in which storage flavor develops quite rapidly, and may be the beginning of off-flavors which later develop into metallic or fishy flavor, particularly in butter.

Stringy Milk—A term often used to describe milk from an infected udder. The condition is due to the presence of masses of leucocytes and fibrin. Unlike ropy milk, stringy milk is recognized as such when drawn from the cow. This is also spoken of as flaky or "gargety" milk.

Sunshine or Activated Flavor—A tallowy, oxidized flavor caused by exposing milk to sunlight and assumed to be due to oxidation of unsaturated fats and a change in the protein.

Sweet Curdling—The coagulation of milk without the action of acid. An abnormal fermentation of milk, due to the formation of a rennet-like enzyme produced by many bacteria. This curdling may be followed by a digestion of the curd either under acid or alkaline conditions, and a bitter taste. This change takes place in milk kept at a low temperature.

Unclean milk—This term is used to describe flavors that are abnormal and objectionable but which cannot be identified accurately.

Weed Flavor—See Feed Flavor.

Yeast Cream—Cream which has undergone a gassy fermentation by the presence of lactose fermenting yeast. The taste is yeasty and the cream foams. *Torula cremoris* is the most common species of yeast causing this defect in cream. Yeasty cream in its first stages is of a pleasantly aromatic "nutty" flavor and odor, which gradually changes into a disagreeable bitterness. The yeasts, while usually present in most cream, develop only under

favorable temperature conditions. Besides spoiling flavor and odor of cream and cream products, they cause much waste by causing the cream to foam over the top of the cream cans with a consequent loss of much of the butterfat and the occurrence of conditions highly objectionable from the sanitary standpoint.

Yeast cream may be prevented by (1) washing and scalding milk utensils after each use, (2) cooling the cream to below 50°F., and keeping it cool.

Yeast Flavor—A flavor defect of milk and its products. It is characterized by its fruity flavor, and slightly fragrant odor, both of which are apparent when the sample is first put into the mouth. As the flavor develops, the aroma becomes more and more distinctly yeasty. Cows that are fed yeast to produce vitamin D milk frequently give milk with this off-flavor.

Yellow Milk—Milk which has acquired a yellow color due to an organism described as *Bacillus synxanthus* which curdles milk and re-dissolves the curd to form a yellow liquid. There are probably several organisms which produce a yellow color; all seem to have proteolytic functions. Yellow milk is very rare, though it is very common to see dirty vessels which have contained milk, become quite yellow.

End of Defects

Denatured Milk—Raw milk from the farm, or milk which has been processed in a city milk plant and whose quality is considered unsafe for human consumption. This rejected milk is treated to be used only for animal feeding. Rennet is used for denaturing this milk and charcoal or red coal-tar dye is used to produce a grayish color to prevent it from being used for human consumption.

Dipped Milk—Before the advent of milk bottles (and even now in some stores and restaurants) milk was dispensed by a dipper to the customer's container. The practice is very unsanitary and out of date. Unless milk is frequently stirred, some customers will get more cream and other mostly skim milk. The practice is also objectionable because of the many possible sources of contamination during the dipping process.

Dried By-Products of Milk—See Handbook Article, P. 176.

Milk Drinks

Nutrition experts concede that there is no better drink than good pure sweet milk. When served rich and cold it is a delicious beverage and a nutritious food as well.

Some persons however will enjoy their milk better when it is flavored with fruits, chocolate syrup or other flavorings. Others enjoy the refreshing taste of buttermilk either natural or cultured with or without additional flavorings. Herewith are suggestions and directions for making some of the more popular milk drinks that are appetizing and easily prepared. For finest flavor cold milk drinks must be served ice cold. Likewise hot drinks should be served piping hot.

APRICOT ADE

2/3 cup sugar
2 cups apricot juice
1 cup cold milk
1/3 cup ice water

Dissolve the sugar in the apricot juice and chill. When ready to serve pour this into the milk and ice water. Shake vigorously or beat and serve immediately.

CARAMEL MILK SHAKE

3/4 cup chilled evaporated milk
1 cup ice water
3 tablespoons caramel syrup
Pinch of salt

Blend and shake or beat vigorously and serve with chipped ice. 2 servings.

CHOCOLATE CREAM WHIP

2/3 tablespoon chocolate syrup or sauce
1/2 cup milk
1/2 teaspoon vanilla

1 heaping tablespoon whipped cream
1 tablespoon powdered sugar
Mix syrup and milk. Add sugar and vanilla to whipped cream and fold into first mixture. Serve cold.

CHOCOLATE MALTED MILK

5 tablespoons chocolate malted milk
1 cup chilled evaporated milk diluted with
1 cup ice water

Mix the malted milk with 3 tablespoons of the diluted milk to a smooth paste. Add this to the rest of the diluted milk. Place in shaker and shake vigorously. Serve with chipped ice.

CHOCOLATE MILK SHAKE

2 teaspoons cocoa or chocolate syrup
3/4 cup milk
Scant teaspoon strong coffee

Mix beat well and chill. Serve in glass

and top with whipped cream and a dash of nutmeg or cinnamon. Must be ice cold.

COFFEE MILK SHAKE

1 cup milk
2 teaspoons sugar
2 tablespoons strong cold coffee
Add sugar and flavoring to milk. Shake well and serve cold.

EGG NOG

1 cup milk
1 egg
1/3 teaspoon vanilla
Pinch of salt
1 tablespoon sugar if desired
Mix egg yolk, sugar, salt and vanilla. Add milk and strain. Beat white of egg until stiff and fold into yolk mixture or garnish on top. Peaches or oranges sliced give flavor to an egg shake.

CHOCOLATE EGG-NOG

1 egg
2 tablespoons cream
3/4 cup milk
2 tablespoons chocolate sauce or syrup
(See recipe for chocolate sauce as given with chocolate milk shake)
Beat egg until fluffy. Add other ingredients blend thoroughly. Chill and serve.

FRUIT EGG-NOG

2 eggs
Pinch salt
3 tablespoons sugar
1/4 cup fruit juice
2 cups ice cold milk
1/2 cup ice cold water
Beat egg yolks until thick and lemon colored, and whites until stiff. Add salt, sugar and fruit juice to yolks combine well and add milk and water. Fold in egg whites pour into tall glasses and sprinkle top with nutmeg.

FRUIT MILK SHAKE

1 mashed banana
1/4 cup lemon juice
1/2 cup orange juice
1 cup canned pineapple juice
1 quart cold milk
Combine mashed fruit and juices. Chill and add them to 1 quart cold milk. Beat and serve cold. Makes a delightful and nutritious milk shake.

GINGER FIZZ

To 3/4 glassful of cold ginger ale add 1/3 glassful milk. Add a tablespoon of honey. Stir well and serve at once.

GINGER FLIP

Add $\frac{1}{2}$ glass ginger ale to $\frac{1}{2}$ glass cold milk. Pour into tall glass and add a serving of vanilla ice cream.

GRAPE BLOSSOM

$\frac{1}{2}$ cup grape juice
 $\frac{1}{2}$ tablespoon sugar
 $\frac{1}{2}$ teaspoon lemon juice
 1 cup milk

Combine ingredients, beat or shake until foamy. Serve ice cold.

ICED COCOA

1 cup milk
 1 teaspoon cocoa
 1 teaspoon sugar
 Pinch of salt

Scald milk. Mix cocoa, sugar, and salt. Dilute with $\frac{1}{4}$ cup boiling water. Boil 2 minutes. Add to scalded milk. To prevent scum from forming, beat vigorously for a minute with egg beater. Chill and beat again before serving.

ICED COFFEE AU LAIT

2 cups chilled evaporated milk
 3 cups strong cold coffee
 1 cup ice water
 2 tablespoons port or sherry flavor
 Blend and shake thoroughly and serve with chipped ice. Six servings.

ICED MOCHA

$\frac{1}{4}$ lb. sweet chocolate
 1 cup strong coffee
 3 to $3\frac{1}{2}$ cups scalded milk
 Melt chocolate over hot water. Add coffee, and cook until stiffened. Add the milk and cook 1 minute. Beat and serve hot or cold with whipped cream. Chocolate should be cold before pouring over ice.

LEMO-LAC

This very refreshing and nutritious drink is made by adding sugar and lemon juice to buttermilk or cultured buttermilk. Slightly more sugar and lemon juice are necessary than in making ordinary lemonade and the mixture should be well iced. It is a fine drink for hungry, thirsty folk on a hot day.

MILK JULEP

1 egg
 1 tablespoon sugar
 1 tablespoon ice cream
 Salt
 Vanilla
 1 cup milk

Beat the egg until light. Add the sugar; beat the mixture, and add the other ingredients. Mix or shake well, and chill.

When ready to serve, beat or shake until foamy. One of the most popular milk drinks and very nutritious.

Many variations in flavor may be made by adding chocolate syrup, sprays of mint, cinnamon, or a teaspoon of caramel syrup in place of the vanilla. The addition of a tablespoon of ice cream makes this an exceptionally delicious concoction.

PRUNE-ADE

2 cups milk
 1 cup prune juice
 Chill milk and prune juice. Add juice slowly to milk and stir thoroughly. Serve in tall glasses with cube of ice.

ROOT BEER SHAKE

1 teaspoon root beer extract
 $\frac{1}{2}$ teaspoon sugar
 $\frac{3}{4}$ cup cold milk
 Mix the ingredients together, beat or shake well, and serve ice cold. Evaporated milk may be substituted for fresh milk by diluting with equal parts of water.

SPICED MILK

2 cups sweet milk
 2 teaspoons sugar
 $\frac{1}{4}$ teaspoon nutmeg
 $\frac{1}{4}$ teaspoon cloves
 $\frac{1}{4}$ teaspoon cinnamon
 Few grains salt
 Heat milk in double boiler. Blend sugar, spices and salt. Add to the hot milk. Beat until spices blend and then chill and serve.

STRAWBERRY MILK SHAKE

$1\frac{1}{2}$ cups milk
 $\frac{1}{3}$ cup crushed strawberries
 2 tablespoons sugar
 Few grains salt
 Combine ingredients, beat thoroughly, chill and serve. Note: The strawberries may be put through a fine sieve if desired.

VANILLA MALTED MILK

Beat together 2 tablespoons malted milk, 2 tablespoons chocolate, caramel or vanilla syrup. Add 1 cup cold milk.

WHEY PUNCH

5 cups whey
 $1\frac{1}{4}$ cups sugar
 Juice of 2 lemons
 1 cup shredded pineapple
 Boil the sugar and 1 cup of whey together for 5 minutes. Cool the mixture, and add the remaining whey, the juice of 2 lemons, and 1 cup of shredded pineapple. Serve the punch with cracked ice or very cold. A few fresh mint leaves, bruised by twisting slightly in a cloth, may be added. Any

MILK DRINKS

fruit juice may be used instead of pine apple Cherries mint leaves or fancy cuts of lemon may be used as a garnish Whey punch has a delicious flavor and is very refreshing For variation flavor with nutmeg or cinnamon

HOT MILK ADE

2 tablespoons sugar
2 tablespoons cream
1 egg
Tablespoon whipped cream
Dash nutmeg
Hot milk to fill the glass
Beat egg add sugar and cream and beat thoroughly Blend in hot milk Top with whipped cream and a dash of nutmeg
Serve in mugs

HOT CHOCOLATE

1½ squares chocolate grated
¼ cup sugar
Few grains salt
1½ cup boiling water
3 cups milk
Mix the chocolate sugar salt and water Cook five minutes stirring occasionally to prevent burning Add the milk and heat to the boiling point If desired ½ teaspoon vanilla may be added Beat and serve very hot with or without whipped cream

COCOA

1 cup milk
1 teaspoon cocoa
1 teaspoon sugar
Pinch of salt
Scald milk Mix cocoa sugar and salt Dilute with ¼ cup boiling water Boil 2 minutes Add to scalded milk To prevent scum from forming beat vigorously for a minute with egg beater

COFFEE AU LAIT

Make strong coffee using the percolator method Scald an equal amount of fresh milk Serve the coffee and hot milk together in equal amounts The coffee and scalded milk may be served cold with a spoonful of whipped cream on top

MOCHA

5 tablespoons cocoa
5 tablespoons sugar
¼ teaspoon salt
1 cup boiling water
1½ cups evaporated milk
1½ cups good strong hot coffee
½ cup hot water
Blend cocoa, sugar and salt Add hot water and stir until smooth Cook slowly

23 minutes Add boiling water milk and coffee Reheat to boiling point Whisk with a Dover beater Serve immediately

POSSET

Hot milk curdled with liquor sweetened spiced served with or without a garnish of crumbled bread cake or crackers

End of Milk Drinks

Evaporated Milk (Whole)—Milk which has been concentrated about 2 to 1 homogenized canned and sterilized by heat It is darker in color more caramelized in flavor and higher in viscosity than similar plain condensed milk It usually contains about 7.9% fat and from 2.9 to 26.2% total solids

It is the most common form of canned milk and will keep for long periods without refrigeration

Composition (U.S. Standard)

Total Solids	Water	Protein	Fat	Lactose	Mineral Matter
20.9%	74.1%	6.7%	7.9%	10.00%	1.4%

If labeled Vitamin D it must contain not less than 7.5 USP units per ounce of finished evaporated milk.

Evaporated Milk, Maternized—Milk modified to resemble in composition mother's milk and then evaporated and canned. Considered by some physicians to be a satisfactory infant food if diluted with the proper amount of water and if the accessory food substances such as lime and vitamins which were destroyed during the evaporation process are added

Evaporated Skim Milk—The product resulting from the evaporation of a considerable portion of the water from skimmed milk, without the addition of sucrose It contains not less than 20% of milk solids Sometimes called Plain Condensed Skim Milk

Composition

Water	Protein	Fat	Lactose	Mineral Matter
%	%	%	%	%
71.9	11.16	0.4	14.94	2.40

Fat Free Milk—See Skim Milk.

Fat in Milk, Milk Fat—See Butterfat

Fat Corrected Milk—Professor W. L. Gaines of Illinois Experiment Station devised a method which he designated as Fat Corrected Milk Method abbreviated F.C.M. The formula which he suggested is $(0.4 \times$

yearly milk yield in pounds) plus (15 x yearly fat yield in pounds). Dr. W. B. Nevens of the University of Illinois gives the following illustrations of the above formula using milk testing 3.4%:
(11,770 lb. milk times .034 = 400 lb. butter-fat annually)

$$11770 \times 0.4 = 4708$$

$$400 \times 15 = 6000$$

$$\frac{10708}{10708} \text{ lb.} = \text{FCM}$$

Dr. Nevens continuing, says it is obvious that the Holstein cow in producing a unit amount of butterfat yields milk containing a larger amount of energy than does a Jersey cow producing milk containing the same amount of butterfat.

Fermented Milks—Special milk drinks which have undergone extensive changes as a result of the growth of microorganisms. There are two main types of fermentations used. The first is an acid formation in which some of the lactose is converted mainly to lactic acid and is commonly found in the various buttermilks. The second type of fermentation represents a combined acid and gas fermentation such as is found in kefir and kumiss. Both acid and alcohol are formed from the milk sugar and a portion of the protein is in part hydrolyzed.

Acidophilus Milk. A fermented milk made by inoculating sterile milk with *Lactobacillus acidophilus* starter and incubating at 98°F. for 18-24 hours and then bottling and holding at room temperature. Sweet acidophilus milk is much more palatable than plain acidophilus milk and is lower in price. It is made by direct inoculation of *L. acidophilus* cultures into fresh pasteurized whole milk. Liberal quantities of lactose are added. Milk soured by a particular bacteria (*Lactobacillus*) is used therapeutically to change bacterial type in the intestinal tract. It is claimed to have considerable virtue in the treatment of certain cases of auto-intoxication.

Araka—An intoxicating brandy-like liquor obtained from the distillation of koumiss—a fermented milk drink. Also known as "rack" or "racky". See Koumiss.

Bulgarius Milk. A cultured milk soured with *L. Bulgaricus* (lactic acid). It develops best at temperatures considerably above that of the ordinary lactic acid germ and at the same temperature as the human body (between 90° to 100°F.), therefore was thought to have special virtues for desirable growth in the intestinal tract and that it had ability to kill off many of the harmful putrefactive germs that often cause

trouble. This was the theory developed and popularized by Metchnikoff. However, more recent research indicates that it is not giving as satisfactory results as had been hoped for and it has been difficult to maintain their growth in the intestinal tract. For this purpose nutrition workers are coming to depend on *L. acidophilus*, a normal intestinal form, which is now more extensively used.

Busa—A fermented milk beverage of Turkistan produced by the growth of lactobacilli (*L. bulgaricus*), yeasts, and streptococci (*S. lactis*) in the milk. The sour, flavored product is similar to Yogurt, Kefir, Koumiss, Leben.

Clabbered Milk—Curdled milk in which the whey has not separated from the curd.

Dadhi—A fermented milk of the yogurt type.

Gioddu—(Cieddu)—An acid fermented milk used in Sardinia. It is similar to the Bulgarian Yogurt.

Gros Lait—A thick, viscous milk with a slight cheesy taste and odor, eaten with a spoon. Such fermented milk is prepared in Bretagne in France.

Kaeider Milk—A fermented milk of high quality. It is generally produced in the cellar, hence its name Kaeider (cellar) milk. It is a mixed fermentation with lactic acid predominating.

Kefir—A fermented or cultured milk characterized by acid and alcohol. It is usually made from the milk of cows or goats, although cows' milk may also be used. The fermentation is brought about by adding Kefir grains to the milk. These golden yellow grains, resembling cauliflower heads, consist of certain bacteria. They increase in size in the fermenting milk and after fermentation is well under way they may be strained off, dried, and kept for long periods of time, for inoculating fresh batches of milk. Fermentation is usually carried on in glass bottles so that the gas formed in the milk becomes effervescent. Kefir is a well known drink in Scandinavia and Central Europe, and has lately been popularized in America. Also known as Kaimor, Kachin, Kaimia, etc.

Kumis-A fermented milk, usually alcoholic, made from curd or whey mixed with or without the addition of sugar (sucrose). The fermentation is due to growth of *Lactobacillus bulgaricus* and *Streptococcus thermophilus* in the milk.

yeasts and *Bacterium lactis acidus Leichmann*. The alcoholic fermentation produces acid and gas but since the milk is fermented in open vessels most of the gas escapes. Kumiss is made chiefly in Russia and in western and central Asia. Also spelled koumiss, kumys and kumys. See Kefir.

Leben—A quick-curdled milk, decidedly acid and with very little or no alcohol common in Egypt. Similar to Yogurt, Ma run etc.

Ma Ju Chiu—A Chinese term for a fermented wine made from mare's milk similar to koumiss.

Mat-oon—See Mazun.

Maja—A term used in Bulgaria and other Eastern European countries for the ferment used in the preparation of their yogurt milk. It is called Podkwassa or Zakvaska.

Ma-un—A fermented milk made in Armenia. Fermentation is produced by inoculating the milk with bacteria of the *lacto bacilli* type.

Mazoradu—A fermented milk common in Sicily.

Omesra—A fermented milk of the Nama. Flottentots in South Africa.

Podkwassa—See Maja.

Rach or **"Racky"**—See Araka.

Skorup—A fermented milk used in Serbia and Montenegro. Similar to yogurt or leben except that cream or boiled milk is used instead of whole milk. Skorup is of a creamy consistency and has an agreeable sour taste and odor. Foods such as potato with a little salt are often added to the skorup.

Skuta—A fermented whey containing considerable alcohol made from sheep's milk popular with the Carpathians.

Skyr—A cultured sour milk popular with the people of Iceland.

Taryk—A milk prepared by shepherds in Tibet by adding sour milk to boiled milk.

Tatté Mèlk, **Taette**, **Tatmyolk**—Viscous orropy milk prepared for the table and considered a delicacy in Norway and other Scandinavian countries. The slimy fermentation is brought about by *Streptococcus taette*, a variant of *S. lactis*.

Urda—A carbonated alcoholic fermented whey somewhat similar to Skuta.

Urgoutnik—A fermented drink of the Balkan mountain people made from sheep's milk boiled and prepared in the same manner as Skorup. It has the same creamy

consistency and agreeable sour taste. See Skorup and Yogurt.

Yams Yogurt—A trade name given to Yogurt—a cultured milk. It seems to be popular in southern California and in certain parts of Canada. Cultures can be secured from dairy bacteriological laboratories.

Ymer—A sour milk drink which is becoming popular in Denmark and to a large extent replacing Yogurt. Made from skim milk soured as ordinary lactic acid starters are made and concentrated by removing most of the curd by separating out the whey after which cream is added. Then this mixture is homogenized and bottled. The mixture filled into bottles at a temperature of about 37°F. The bottles are held at ice temperatures until consumed.

Yogurt, **Yoghurt**—A fermented milk common in Bulgaria and other Balkan states and characterized by a high lactic acid fermentation. It is prepared from goat's or buffalo's milk, boiled in clean earthenware pots over a slow fire until volume is reduced by 1/4 or 1/2 or more. Then it is cooled to 45° or 50°C (115°F or 122.0°F) after which a small amount of "maja" or ferment is added. The ferment is left over from a former batch. After mixing thoroughly with the freshly boiled milk, the pot containing the mixture is wrapped in skins or cloth so as to hold an even temperature for 10 to 12 hours. The milk or Yogurt is then ready for use. It is a jelly-like product sweet to taste with a pleasing odor. Enough acid has developed to cover up the boiled taste of the product.

Yogurt Modern Method of Making—For modern day plant production on a large scale in the U. S. the following formula is used. It is desirable to have a concentrated milk containing about 20% total solids. This of course is best prepared by evaporation of whole milk in a vacuum pan. It can also be prepared by adding whole milk to evaporated whole milk. This mixture is again pasteurized for about thirty minutes at 180°F after which it is quickly cooled to 115°F. To its total weight is added about 2% of the yogurt starter and mixed thoroughly. After standing for one and one-half to two hours the milk is stirred and transferred to containers in which it is to be marketed. These containers are then incubated at about 114°F for about two hours at which time the milk should be thoroughly coagulated. Then the jars can be placed in the refrigerator at a temperature not more than

50°F. and it can be marketed after about eight hours in the refrigerator. Satisfactory yogurt cultures can be obtained in the U.S. from bacteriological laboratories. *Zakvaska*—See *Maya*.

Filled Milk—Imitation evaporated milk. It is made by extracting the butterfat from whole milk and replacing it by some vegetable oil, principally coconut, and evaporating the resulting emulsion and processing like evaporated milk.

Fluid Milk—General term for all fresh bottled milk. Includes all types and grades of milk.

Fluid Milk, Homogenized Vitamin D—Fresh bottled milk that has been fortified with added vitamin D and homogenized.

Freshly Drawn Milk—Milk as it is drawn from the cow. Freshly drawn milk is practically uniform in composition. However, since there is a good deal of difference in the speed of milking and the length of time it has been standing, and since the butterfat very quickly begins to rise, it is recommended that in sampling freshly drawn milk it be poured from one pail to another once or twice before test is made.

Goat's Milk—is very similar to cow's milk although it has smaller fat globules, higher percentage of butterfat and sugar. The composition of the fat is sufficiently different so that the milk has a characteristic odor.

Golden Crest Milk—Trade name used by several Borden fluid milk units for their superior quality product.

Golden Guesney Milk—Milk produced by Guernsey cattle and sold under the patented name of Golden Guernsey Milk. The Guernsey Breeders Association licenses the producers and distributors and requires that they adopt certain sanitary practices and have certain equipment necessary for the production and handling of high quality milk. For details write to American Guernsey Cattle Club, Peterborough, New Hampshire.

Grades of Milk (U.S. Public Health Service Ordinance) (USPHS)

Certified Raw
Grade A Raw
Grade B Raw
Grade C Raw
Accredited Milk
Pasteurized

Certified Pasteurized
Grade A Pasteurized
Grade B Pasteurized
Grade C Pasteurized
Homogenized
Tuberculin-tested

Definitions of these grades follow:

Certified Milk, Raw—A special grade of milk, produced under the supervision of a medical milk commission which lays down and enforces rules for its production. Among the requirements are strict cleanliness of cows and stables, tuberculin and Bang tested cows, regular physical examination of employees, bacteria count of milk not to exceed 10,000 colonies per cc., and a special bottle cap. Formerly, all certified milk was sold raw but now much of it is pasteurized. Because of increased cost of production, certified milk is much higher in price than higher market milk.

Certified Milk—Pasteurized—Certified raw milk which has been pasteurized, cooled, and bottled in a milk plant conforming with the requirements for Grade A Pasteurized Milk.

Grade A Pasteurized Milk—USPHS (code)—Grade A raw milk (with such exceptions as are indicated if the milk is to be pasteurized) which has been pasteurized, cooled, and bottled in a milk plant conforming with all sanitary requirements, and the average bacterial count of which at no time after pasteurization and until delivery exceeds 30,000 per cc.

Grade A Raw Milk—USPHS (code)—Raw milk, the average bacterial count of which does not exceed 50,000 per cc., and which is produced on dairy farms conforming to all requirements of sanitation. Cows must be free from tuberculosis and brucellosis (contagious abortion) often referred to as Bang's disease; attendants must be free from communicable diseases; barn, milk house, water supply, and utensils must be such as to comply with U.S. Milk Ordinance.

Grade B Pasteurized Milk—USPHS (code)—Pasteurized milk which violates the bacterial standard for Grade A Pasteurized Milk and/or the provision of lip-cover caps and/or the requirement that Grade A raw milk be used, but which conforms with all other requirements for Grade A Pasteurized Milk, has been made from raw milk of not less than grade B quality, and has an average bacterial count after pasteurization and before delivery not exceeding 50,000 per cc.

Grade B Raw Milk—USPHS (code)—Raw milk which violates the bacterial standard and/or the abortion testing requirement for Grade A Raw Milk but which conforms with all other requirements for Grade A Raw Milk and has an average bacterial count not exceeding 1,000,000 per cc

Grade C Pasteurized Milk—USPHS (code)—Pasteurized milk which violates any of the requirements for Grade B Pasteurized Milk.

Grade C Raw Milk—USPHS (code)—Raw milk which violates any of the requirements for Grade B Raw Milk.

Accredited Milk—Milk from a herd accredited for both tuberculosis and brucellosis. See Accredited Herd.

Homogenized Milk—"Milk which has been mechanically treated (passed through a homogenizer) so as to alter its physical properties with particular reference to the condition and appearance of the fat globules." The globules are reduced in size to an average of about 1 micron. The milk will not cream nor churn after processing neither can it be separated.

Pasteurized Milk—Any milk that after pasteurization contains not more than 100,000 bacteria per cc.

Tuberculin tested Milk—Milk from an accredited tuberculin-tested herd.

Half and Half—Consists of approximately half milk and half cream. Tests about 10% to 12% fat. Also called Cereal Cream.

Human Milk—See Reference Section p—
Briefly it contains more albumin and less casein and it is more alkaline than cow's milk.

Humanized Milk—A term sometimes applied to cow's milk that has been modified to conform quite closely in composition to human milk.

See Modified Milk.

Imitation Evaporated Milk—See Filled Milk.

Irradiated Milk—Normal milk in which the concentration of vitamin D has been increased by irradiation with ultraviolet rays.

Khoa—A concentrated milk of Indian origin made by placing milk in an open pan on a fire and vigorously stirring it until it is concentrated.

Kosher Milk—A product prepared in accordance with Jewish ritual law. In gen-

eral it means that milk must be produced in the presence of a person of the Jewish faith who certifies that the product is "Kosher."

In general Kosher butter and Kosher cheese must be made from kosher produced milk. See also Commercial Soured Cream.

Malted Milk—(U.S. Standards)—"Malted milk is the product made by combining whole milk with the liquid separated from a mash of ground barley malt and wheat flour with or without the addition of sodium chloride sodium bicarbonate and potassium bicarbonate in such a manner as to secure the full enzymic action of the malt extract, and by removing water. The resulting product after drying contains not less than 75% of butyrfat and not more than 35% moisture."

Market Milk—Milk intended for fluid milk consumption.

MILK POWDER

Milk dehydrated by evaporation to about five per cent of moisture. Also called Powdered Milk or Dry Milk, Skim Milk Powder and Whole Milk Powder.

Dried Compressed Milk (Cake Form)—This form of dried milk was developed and used to considerable extent during World War II. It was used in rations flavored with various fruits and chocolate. It is not very soluble and causes considerable trouble in getting it properly dissolved in soups and for other uses. It seems that its use will be somewhat limited except for emergencies where concentration of food material is highly essential.

Freeze Dried Milk—This is milk powder prepared in the usual way by vacuum evaporation of water. It compares well with best quality spray dried powder. So far the only objection is the greater expense involved in its manufacture. See Lyophilization.

Low Heat Nonfat Dry Milk—Nonfat dry milk manufactured by subjecting the skim milk to pre-condensing temperatures of approximately 155°F instead of the conventional 180°F, 200°F.

Malted Milk Powder—This powder is much different from other forms of milk powder in that it contains a large proportion of nonmilk material derived from barley and wheat flour. The product is made by soaking barley to allow grain to germinate. This is dried then a mash is prepared by

heating the wheat flour in the presence of water until the starch has been gelatinized and then the paste is cooled and thoroughly mixed with the crushed malt. It contains a large amount of enzymes capable of digesting starch. These malt enzymes convert the starch to malt, soluble maltose and dextrins. The resulting solution is generally filtered to remove barley husks, then it is mixed with an equal volume of whole milk, and dried. The finished product is required to contain at least 7.5% milk fat and not more than 3½% water.

Composition

Water %	Protein %	Fat %	Lactose %	Mineral Matter %
3.29	13.19	7.55	72.40	3.66

The U.S. Federal standard provides that Malted milk shall contain not less than 7.5% milk fat and not more than 3.5% moisture.

Nonfat Dry Milk—See Skim Milk Powder.

Skim Milk Powder—Made by removing most of the fat and water from milk. The moisture content must not exceed 5% and the fat content should not exceed 1.5% unless the fact is specified.

Also called Nonfat Dry Milk, and Milk Solids Not Fat.

Whole Milk Powder—Dried whole milk is the resulting product when water is removed from milk. Such a finished product must contain at least 26% milk fat and not more than 5% moisture.

Composition

Water %	Protein %	Fat %	Lactose %	Mineral Matter %
2.00	26.91	28.65	36.50	5.94

Whole Milk Powder, Gas Packed—Gas packing or packing in the absence of oxygen is proving very successful especially in the packing of spray dried whole milk powder. Experiments show that the keeping quality of this product increases as the oxygen content of the can is reduced. A large portion of the gases is removed by this process and filled with pure nitrogen. See books on Milk Powder Manufacture for more details.

MILK PROCESSING AND PROCESSING EQUIPMENT CONDENSERS AND CONDENSING

Condenser—The piece of equipment attached to the top of a vacuum pan, for

the purpose of reducing to water the vapors arising from the boiling milk in the pan. Condensation is accomplished by bringing the vapors in contact with cold surfaces or by passing them through a cold water spray.

Barometric Jet Condenser—A milk condenser which connects with and discharges its water into a tight cistern in the ground. The height of the condenser depends on the altitude or barometric pressure at the factory. The higher the altitude (the lower the pressure), the lower the condenser is placed above the cistern. The water column seals the vacuum and permits the water discharged from the condenser to escape automatically.

Spray Condenser—A condenser used in vacuum pans and concentrating units. It consists of a large metal cylinder, which may be horizontal, vertical, or diagonal, a spray pipe and spray plate. Maximum efficiency is obtained with types having the maximum water surface and the longest possible contact between water and vapors. Also called Jet Condenser.

Surface Condenser—Usually consists of a number of tubes within a cylinder. The cooling water circulates outside the tubes, while the vapors pass through them but in the opposite direction. The water used for cooling is kept separate from the water of condensation, thus making possible the accurate determination of the amount of water evaporated.

Wet Vacuum Spray Condenser—A spray type of condenser, the one most commonly used in condensed milk factories. It differs from the barometric condenser in that it dispenses with the water column and cistern and discharges all the water with the air and non-condensable gases through the vacuum pump.

Milk Trap, (Expansion Tank)—A small receptacle or device used on condensing equipment. It is located between the dome of the vacuum pan and the condenser in cases where the condenser is placed outside of the pan. The milk trap collects any milk that may be splashed or carried over from the pan and which would otherwise escape through the condenser during the operation of the vacuum pan. Also called "Entrainment separator."

Separate units of copper or stainless steel are available for installation with older vacuum pans, but in the new vacuum pans

these entrainment separators are built as an integral part

Condensing—Condensing as applied to concentrated milks is accomplished by the evaporation of water in a vacuum retort of which there are many styles. Under a vacuum the water will boil off at low temperatures (110°F to 140°F) thus largely preserving the natural characteristics of the product involved.

Continuous Condensing—A system whereby concentrated milk may be pumped from an operating vacuum pan continuously while fluid milk is being fed into the pan. A heavy duty pump is the only piece of equipment needed to convert a batch operation to a continuous one. The pump must be either a variable speed unit or some of the milk removed must be by-passed back into the pan as a means of controlling the degree of concentration.

Forced Crystallization Period—An intermediate period during the process of cooling sweetened condensed milk. It is that period in the cooling process at which the formation of small sugar crystals is accelerated. This period lies approximately between 86° and 75°F and should be from about 15 to 25 minutes. The period is considered important in the process of manufacturing sweetened condensed milk in order to control the smoothness of texture of the finished product by preventing the formation of large sugar crystals.

Striking—The process of drawing a sample of condensed milk from the vacuum pan and testing for density.

Sugar Well—A tank used in the manufacture of sweetened condensed milk. It is used for adding sugar to small portions of hot milk before the latter enters the vacuum pan. It is usually equipped with a mechanical reversible stirrer which moves to and fro on an eccentric facilitating the dissolving of the sugar.

Superheater—1 A steam distributing device on the end of a direct steam line for superheating condensed milk in the vacuum pan.

2 Also a steam jacketed kettle with agitator for forewarming milk under pressure before condensing.

Superheating—1 The practice of blowing live steam into concentrated milk in a vacuum pan until the temperature has risen from 135-140°F to 180-200°F. This

temperature is maintained until the milk has become sufficiently thick and the desired viscosity has been obtained. Its chief purpose is to precipitate partly the curd to give a greater body and consistency to the product.

2 The practice of forewarming milk to very high temperatures under pressure—221 to 248°F—before it is condensed.

Vacuum Pan—A large steam jacketed vacuum kettle used in concentrating milk products. Under a 2.26 inch vacuum the milk usually boils at about 130°F. At the top of the pan is a large condenser where the vapor arising from the boiling milk is condensed with a spray of cold water. Vacuum pans are now built exclusively of stainless steel and vary in size from 3 ft to 7 ft in diameter.

Vacuum Pan, Sampling Valves in—Valves located at the bottom of the jacket of a vacuum pan holding tank or other equipment. There are usually two of these valves and a short nipple between them to make possible the sampling of the condensed milk while a pan is in operation. Both of these valves are closed during the condensing process. When samples are desired the upper valve is opened. This allows the condensed milk to run into the nipple. The upper valve is then closed and the lower one opened. The milk then runs out freely. In tanks and other equipment not under vacuum a sampling valve is simply a single valve to permit the collection of a sample from the equipment.

Vacuum Pan (Rapid Circulation)—A type of vacuum pan in which a series of straight, narrow tubes are arranged vertically in a steam chest below the vapor chamber of the pan or to one side. The milk level reaches part way up these tubes. The tubes are open at both ends to allow continuous circulation of the milk. The steam surrounding the tubes causes the milk to boil partly vaporize and to travel rapidly up through the tubes thus exposing a large surface of milk to the heating surface. In the space of a few seconds of time and thereby increasing the speed of evaporation. The condensed milk returns through return tubes or downtake chamber. This type of pan makes efficient use of exhaust steam.

Types of rapid circulation vacuum pans are: Buffalo Rapid Circulation Evaporator, Scott Vacuum Evaporator, Herman Stier Acceleration Type Vacuum Pan.

Vacuum Pan, Herman Stier Acceleration Type—This type of vacuum pan is similar in principle to the Scott Evaporator. The open-end, double-pipe circulation system is used. It differs from the Scott Evaporator in that it makes use of the barometric condenser. The cooling water passes through the vertical spray pipe in the condenser and is sprayed into the vapors as they come from the pan. The condensed vapors are conveyed out of the apparatus through the standpipe into the sewer.

Vacuum Pump—A pump for creating the desired vacuum in a vacuum pan during the condensing of milk. A vacuum pump should be installed as near the pan as possible in order to secure the full benefit of the vacuum.

COOLERS

Milk Coolers—Equipment used for cooling milk by passing it over a cool surface, or between cold surfaces.

Drum Cooler—A milk or cream cooler consisting of two cooling cylinders, one inside the other, the inner cylinder revolving. The milk or cream flows in a thin layer between the cooled surfaces of the two drums.

External Conical Cooler—A small cooler for use on the farm. It is cone-shaped, and the surface may be smooth or corrugated. Its enclosed compartment is filled with water and broken ice. Milk is poured into a receptacle at the top of the cooler, passes through a small opening in the bottom of the receptacle, and spreads out evenly over the entire cooling surface. This type cooler will bring the temperature of the milk to within 5°F. of the temperature of the cooling water.

Internal Tubular Cooler—A milk cooler so constructed that the warm milk passes through a pipe which is itself enclosed in a pipe containing the cooling medium. The cooling medium usually circulates in a direction opposite to the flow of the milk.

Plate Cooler and Pasteurizer—This is made up of a large number of plates clamped together with proper passageways for milk or cream and for water so that a complete heating, holding, regenerating and cooling can all be done in one small compact apparatus.

Surface Cooler—A device for cooling milk whereby the milk passes in a thin film over the surface of tubes containing the cooling medium. The cooler is so constructed that

water can be used in the top section and brine or refrigerant gases or liquids in the bottom section of tubes. The milk pours down over the tubes, being cooled first by the water and then by the refrigerant. Also known as External Tubular Cooler.

Cooling Cabinet—A milk cooler in the form of a small oblong cabinet containing several units or sections of one-inch tubes in parallel arrangement, each section being similar to a surface cooler. The number of sections varies from 7 to 11 with rated capacities of 12,000 to 20,000 lb. of milk per hr. Cabinet coolers are easily cleaned by removing the side panels and taking out the tubes, and they take up little floor space.

Cooling Media—That which is used to cool the milk from pasteurizing temperature. Usually water (but sometimes milk, as in regenerative process) is used first to bring the temperature down to about 60-75°F. Then it is cooled to a lower temperature by direct expansion of ammonia, brine or sweet water.

Cooling Tank—An insulated tank built of concrete, wood, or metal, for cooling of milk in cans on the farm, by means of running water or ice water contained therein. Cooling tanks may be electrically operated and controlled by means of a compressor, expansion coils and motor.

More recently "cold wall" tanks are being used for farm cooling of milk. These are units which include a compressor and the refrigeration is supplied either as ice water from an ice bank or as direct expansion gas directly to the back of the inner surface of the tank. These tanks or vats are of stainless steel and fabricated to equal sanitary standards with vats and tanks used in fluid milk plants for holding and processing milk. They are a necessity where "bulk handling" methods are to be used in transporting milk from the farm to plant.

DRIERS, EQUIPMENT AND PROCESSES FOR DRYING MILK

Buslovak Drum Drier—A vacuum milk drier which consists of a vacuum chamber, containing a hollow, steam-heated drum which turns in Sumet Bearings provided at both ends of the drier. The milk is held in the chamber and is continuously pumped to a shallow pan below and close to the drum surface. Since a slight pressure is maintained in the pan, the milk is forced against the drum surface where it is dried.

Campbell Process—One of the earlier processes for the manufacture of powdered milk patented and improved by J. H. Campbell. The process consists chiefly in concentrating milk to a high degree by blowing heated air through it in an open vat. The milk of butterlike consistency is then reduced by a shredding machine after which it is placed in a drying chamber for thorough desiccation and then powdered by grinding and bolting or sifting.

Collis Buttermilk Drier—One of the earlier buttermilk driers of the single drum unit type consisting of a spray pipe with pump and supply tank and a battery of storage tanks so connected with the pump as to provide continuous agitation of the fluid buttermilk. The pump also services the supply tank underneath drying drum. A second pump forces the buttermilk from the supply tank against the side of the revolving drum in the direction of its rotation. Its inventor the late Mr. N. P. Collis had much to do with the development of buttermilk drying. He established and operated a large centralized butter milk drying plant in St. Paul, Minnesota.

Dough Drying System—An early crude process for drying milk. The milk is condensed to a doughlike consistency by one of several methods. The condensed product is then spread on trays and dried to a hard consistency in special drying chambers. After drying the product is ground to a fine powder.

Drum-drying System, (Film-drying System)—The drying of milk on heated revolving metal drums. The milk to be dried is conveyed to the surface of one or more of these drums which are charged with hot water or steam under pressure. The revolving drum picks up a thin film of the liquid milk. By the time it has made one revolution the film is practically dry and is scraped off by a stationary knife or scraper. The product is then conveyed to the grinder or bolter where it is ground to a fine powder.

Drum-drying or film-drying is done both under atmospheric pressure and in vacuo. By enclosing the drums in a vacuum chamber and drying under reduced pressure a superior product of greater solubility results.

Dry Milk Redryer—This unit is attached to the discharge end of a spray dryer. It

makes it possible both to cool and to reduce the moisture content of the dry milk.

Ekenberg Process—A film drier process developed by Martin Ekenberg and used in the manufacture of milk powder. It operates in a partial vacuum. The machine which does the drying is called an exsiccator. It consists of a revolving steam heated drum enclosed in a vacuum chamber. The milk is first partially condensed by being brought in contact with the concave ends of the rolls. Then it is removed from the chamber by a pump and again sprayed on the hot rolls. The dried milk is removed from the rolls by a scraper. Then it is placed in a drying chamber at 90°F (32°C) until the milk sugar crystallizes.

Entrainment Separators—See Milk Trap (Expansion Tank).

Gathmann Process—A process for the manufacture of powdered milk perfected by Louis Gathmann in 1906. The process is similar to the Just process where the milk is dried in the form of a film on a revolving steam heated drum under atmospheric pressure.

Govers Milk Drier—A vacuum milk drier invented by Francis X. Govers. A continuous flow of hot water passes through revolving metal cylinders at a temperature of about 157°F in vacuo.

Hatmaker Process—A process for powdering milk similar to the Just Process. Described in detail in evaporated milk texts. See Just System also Just Hatmaker Process.

Instantizer or Instant Solubility System—A machine now in the market for making instantly soluble nonfat dry milk. Briefly with this equipment the ordinary nonfat dry milk made by spray process can be processed so that its physical state is changed in such a manner that it will instantly mix with hot or cold water. This change apparently is accomplished by transforming the fine powder into "fine clusters." This is done by wetting the particles just enough to make them stick together when they make contact. When redried the clusters will then mix instantly. This seems to be due to the fact that the milk sugar has remained readily soluble in water and the structure of the clusters is porous to such an extent that

the water can get into and surround the particles which make up the cluster thus getting quick solubility.

James Bell Milk Drier—A milk desiccator invented by James Bell Machinery Co., Melbourne, Australia. The milk is dehydrated under atmospheric pressure by two revolving metal drums with scrapers which automatically remove the film after each revolution of the drums.

Just System—A method for making powdered milk. The apparatus consists of 2 polished metal cylinders which are side by side and slightly separated. They revolve inversely at the rate of about 6 revolutions per minute. They are heated by superheated steam so that the outer surface of the cylinders reaches above 212°F. The milk flows from a pipe between the rollers and forms a very thin layer on the rollers. The water is quickly evaporated and a knife cuts the milk from the cylinders in continuous sheets which are caught in receptacles where they break up. The dry milk is then ground to a fine powder. See Just-Hatmaker Process.

Just-Hatmaker Process—A modification of the original Just Process for the manufacture of powdered milk. James R. Hatmaker purchased the Just patents and later put out this modification known as the Just-Hatmaker process.

Krause Centrifugal Spray Dryer Process—This spray dryer was invented by Dr. Krause of Munich, Germany. The outstanding feature of the Krause process stems from the unique method of atomizing the milk by centrifugal force. For full details see book on "Condensed Milk and Milk Powder" by Hunziker.

Merrell-Merrell-Gere Process (Merrell-Soule Process)—A spray process used in making milk powder. The milk is first partly condensed in an ordinary vacuum pan; then, by means of a pressure pump, it is forced into the drying chamber in the form of a fine spray or mist.

Mignot-Plumey Milk Dryer—A milk desiccator invented by Mignot and Plumey. The machine consists of 2 revolving drums, one 12 in. in diameter and the other 30 in. in diameter. The smaller drum is not heated and revolves in the milk which is thus conveyed to the surface of the larger heated drum. If the temperature rises higher than 92.94°C. (197.6-201.2°F.), the large cylinder presses closer against the

small cylinder due to increased heat expansion. This makes the milk film thinner.

Passburg Process—A vacuum milk drier process invented by Emil Passburg. The film drier operates under reduced pressure. The milk is drawn into the drum casing or vacuum chamber by the force of the vacuum in the chamber. The revolving steam-heated drum dips into the milk in the vacuum chamber and picks up a thin film of milk which dries under reduced pressure while the drum revolves once. The dried film is removed by an automatic scraper.

Spray-Drying System—A system for drying milk whereby the milk is transformed into a fine spray or mist in the presence of currents of hot air. The hot air takes up the moisture from the milk and the solids form small dry milk flakes on the sides and bottom of the hot air chamber. In most modern apparatus this deposit of powder is removed from the hot air chamber as soon as it is formed. Spray dried powder is of the best quality and is usually preferred to drum or film-dried powder.

Wimmer Process—A process used in the manufacture of powdered milk invented by Ole Bull Wimmer of Copenhagen, Denmark. The milk is pre-condensed in a vacuum pan similar to that used in the manufacture of condensed milk. In place of coils, the vacuum pan is equipped with a mechanical stirrer. The milk is condensed at a relatively low temperature and is stirred until about 30% of the moisture is removed. Desiccation is then completed in the open air, after which the product is ground to a fine powder.

Emulsifier, (Emulsor, Emulser, Creamer)—A machine which acts on the same principle as an homogenizer, but does not reduce the size of the fat globule as markedly as does the latter, nor does it influence the viscosity or affect the proteins of milk as noticeably. It is used primarily in small milk plants where it is desired to produce coffee cream in which the fat will not rise readily. It is not satisfactory for homogenized milk because the stability of the fat emulsion is not great enough to prevent considerable creaming. It is used, however, in reconstituting dry skim milk with butter or butter-oil and water to make a reasonable imitation of fluid milk in areas and places where fresh milk is not obtainable.

EVAPORATING PROCESSES AND EQUIPMENT

Evaporator—An apparatus usually closed for driving off a certain amount of superfluous liquid. The evaporator or vacuum pan is the essential piece of equipment in a milk condensery in it the condensing of the milk is accomplished. It is used in the manufacture of all types of concentrated milk such as evaporated milk, plain and sweetened condensed milk, also in the semi-concentrated milk now on the market.

The vacuum pan unit generally consists of five parts: heating surface, vapor space, separator, condenser, vacuum pump and necessary accessories.

There are also evaporators consisting of two and less commonly three effects also known as multiple-effect evaporators. The vapors from the first effect are used for heating in the second effect, the second in the third and thus makes the most complete and economical utilization of the steam. However, since the temperature to which milk is exposed increases with the number of effects, two is about the limit for milk.

Bufflovak Rapid Circulation Evaporator—In this type the steam chest and milk tubes are placed at an angle. The milk passes up through the steam heated tubes at great velocity and is discharged in the vapor body against a baffle plate. This baffle plate is placed at an angle which causes the vapors and milk spray to be separated. The vapors pass out of shell and the milk returns to be repeatedly discharged against the baffle plate.

Lo-Temp Evaporator—This is used for condensing milk at temperatures below the body temperature of the cow and before it goes into the Spray Dryer. This makes it possible to obtain a finished product of exceptionally good quality.

Scott Vacuum Evaporator—An upright pan in which there are a number of vertical 2-inch pipes enclosed in 4-inch pipes. The larger pipes are exposed to steam under pressure. The milk passes up through the 2-inch heating tube, overflows at the top and runs down through the hotter 4-inch pipe. A continuous circulation is kept up until product is sufficiently concentrated.

Film Grain—The degree of visible coagulation produced in sterilized evaporated milk. Used to evaluate heat stability and viscosity.

Forewarmer—A steam jacketed kettle or a combination of a continuous flow pasteurizer and steam jacketed kettle used in heating milk to temperatures from 150°F to boiling prior to condensing in the vacuum pan. Forewarming raises the heat coagulation point and stabilizes the casein when the heat treatment is at a high temperature and also aids in bacterial and enzyme control. Its purpose is to facilitate the operation of the pan to take the place of a pasteurizing process or to stabilize the casein and impart greater water holding properties.

Leak Detector—A mechanical means present on all continuous milk lines for the purpose of "stripping out" defective containers from the sound ones during the processing of evaporated milk.

Lethality—Sterilizing value as in the continuous sterilization process, a precise time-temperature relationship is established which permits high efficiency of sterilization of the product as in evaporated milk. Known and accepted mathematical procedures are used to determine this value.

Preheater, Continuous (Evaporated Milk)—A machine designed to receive cold cans of milk and by passing them through a graduated temperature zone heats the product gently up to near sterilization temperature.

Ratio of Concentration—A necessary composition factor in evaporated milk manufacture determined by dividing the per cent of total solids in the finished evaporated milk by the per cent of total solids in the original fluid milk. For the U.S. standard the ratio is about 2 1/4, i.e. it requires approximately 2.25 lb of fluid milk to make one lb of evaporated milk.

Thermo-Compression—An arrangement wherein a portion of the vapors discharged from an evaporator effect is captured and compressed to a higher pressure and temperature for re-use on the hot side of the heating surface. This is accomplished by the use of a thermo-compressor using the energy of the boiler steam supplied to the evaporator to entrain and compress the low-pressure spent steam for re-use in the same body or effect. A thermo-compressor is similar to and operates on the same principle as the steam jet ejector. Pressure levels are dictated by the design of the particular evaporator.

Types of Cans

Sanitary Can—Open-top container used for some American but all Canadian pack evaporated milk. It is filled "open" and closed in a closing machine after filling.

Venthole Can—Floated type soldered can commonly used for evaporated milk in the United States. Common sizes of these containers are: 14½ oz. and 6 oz. capacity. The "vent" hole used for filling is approximately ⅛" diameter. It is closed with a drop of solder at the filler.

HEATERS AND HOLDERS

Heaters, Batch Type—A large vat or tank simply constructed and provided with a means of heating a batch of milk to the desired temperature. Besides being used as a heater, it is also used as a holding vat in many plants. Heat is supplied either by hot water circulating through revolving coils or by the introduction of the heating medium into a jacket surrounding the milk which is slowly agitated. Vats vary in capacity from 50 to 1000 gallons.

Heaters, Continuous Flow—Milk heaters in which a steady stream of milk passes through the heater thereby being heated to a high temperature in a few seconds. Continuous flow heaters are often called flash pasteurizers and are used as such in the pasteurization of cream and other dairy products. Examples of continuous flow heaters are the Danish heater, drum heater, and internal tubular heater. Plate type heaters (pasteurizers) are now more extensively used than the above. See Plate Type Pasteurizer.

Danish Heater (Kettle Heater)—A milk heater consisting of a kettle-like chamber surrounded by a jacket into which steam enters and condenses to hot water. The milk is thrown against the sides of the hot water jacket by a revolving agitator and is then forced out through a pipe at the top.

Drum Heater (Film Heater)—A milk heater in which the milk is heated either by passing in a thin film between two or more upright heating surfaces or by flowing over a drum inside of which is the heating medium.

Internal Tubular Heater—A milk heater in which the milk is heated to pasteurizing temperature or any other desired temperature by passage through a tube enclosed within another tube. Hot water circulates through the outer tube, traveling in a

direction opposite to that of the milk. By means of automatic temperature control it is possible to control temperature to a fraction of a degree.

Holders (Pasteurization)—Insulated or jacketed equipment for holding milk at pasteurization temperature for the desired length of time after it has been heated.

Batch Holders—Vats, tanks or pocketed compartments used for holding milk at pasteurizing temperature for the desired length of time to complete that process, usually thirty minutes.

Continuous Flow Holder—Apparatus for holding milk at pasteurizing temperature during the holding period. Regardless of the type of continuous flow holder, whether it be revolving, tubular, or a series of tanks, it works on the principle that the milk enters at one end of the apparatus and takes 30 minutes to flow to the discharge end.

Multiple-compartment Holders—Tanks or vats to hold milk for a certain time at the same temperature to which it has been heated during pasteurization. The holder is divided into 8 compartments, each filled in regular order automatically with milk pumped through tubular heaters. After the milk has remained in each compartment for at least 30 minutes, it is released and passed to the cooler.

Pocket Holders—A series of tanks or compartments, either stationary or revolving, into which milk flows after being heated to pasteurizing temperature and from which it is released after the holding period.

HOMOGENIZATION

The process of subdividing the fat globules in liquid dairy products to a smaller, more uniform size by forcing them under pressure through a homogenizer. Their viscosity is usually changed. The fat globules do not rise again, the product becomes smooth, and the physical and chemical structure of the liquid may be changed somewhat. This process is used mainly in the ice cream mix and the evaporated milk trades, but there is also a rapidly growing demand for homogenized fluid milk and for the so-called cereal or coffee creams and sour cream which are homogenized.

Homogenization, One-Stage—The use of a single valve in the process of homogenization. This process accomplishes two ob-

jectives 1 The fat globules are subdivided into several times the original number and are consequently much smaller

2 The small sized globules tend to cluster into bunches or clumps which are quite stable This bunching of the fat increases the viscosity

Homogenization, Two-Stage—The use of two valves in the process of homogenization This process reduces the size of the fat globules and disrupts the fat clumps formed by the first valve The clumps do not form again to anywhere near the first size This greatly reduces the viscosity compared with a single stage treatment due to the more efficient breaking up of the fat and there is consequently less tendency toward cream separation and churning

Homogenization Efficiency Index—A measurement for the efficiency of homogenization The United States Public Health Service (USPHS) defines homogenized milk as milk which has been treated in such a manner as to insure breakup of the fat globules to such an extent that after 48 hours quiescent storage no visible cream separation occurs on the milk and the fat percentage of the top 100 ml of milk in a quart bottle or of proportionate volumes in containers of other sizes does not differ by more than 10% of itself from the fat percentage of the remaining milk as determined after thorough mixing

$$\text{Thus USPHS Index} = \frac{\% \text{ top test} - \% \text{ bottom test}}{\% \text{ top test}} \times 100$$

and must not exceed 10%

The efficiency of homogenization can also be evaluated by microscopic examination of the fat globules in the product

Homogenization, Sonic—A method for producing soft curd milk by exposure to sonic vibrations Reduction in the curd tension of the milk is accomplished by passing the fluid in a thin layer over electromagnetically driven diaphragm sources of intense sonic vibration It is sometimes referred to as sonic oscillation

Homogenize—To force a substance through a small opening under pressure To force milk or cream or ice cream mix through a homogenizer in order to make the product smoother textured and of uniform consistency throughout This is done by breaking up the solids especially the fat

into units very much smaller than their natural state

Homogenizer—A high pressure pump consisting of one or more cylinders each having a suction and a discharge valve As the machine sucks in the milk cream or ice cream mix or other liquids to be blended, these products run through the discharge valves which empty into a common discharge pipe A valve in this pipe is so constructed that the liquid is forced through an exceedingly small opening against a hard metal surface The size of this opening can be varied by regulating the pressure on the valve Some machines are equipped with two or more such homogenizing valves When the milk or cream etc is passed through the homogenizer there is a decided reduction in the size of the fat globules There are other types of machines on the market based on slightly different principles but at the present time the "Manton-Gaulin" two-stage homogenizer the Creamery Package multistage valve and the "Cherry Burrell Superlomo" are among the most commonly used homogenizers

Irradiators—The first milk irradiator developed was equipped to allow milk to flow in a thin film over the inner surface of a cylinder with a carbon arc lamp suspended in the center so that the ultra violet light was uniformly distributed over the cylinder This type is now equipped with three phase arcs to increase the production of Vitamin D milk with a potency of 400 U.S.P. units per quart Another type irradiator is equipped with carbon arc lamps with reflectors to concentrate light rays on a milk film formed on a flat type surface cooler An irradiator equipped with a quartz mercury lamp is also used

Irradiation—As applied to milk the process of exposing milk to ultra violet rays

PASTEURIZATION

A process of heating milk to a temperature of 142°-145°F and holding at that temperature for not less than 30 min (holder process) or to a temperature not lower than 160°F and holding at that temperature or above for not less than 15 sec (high temperature short time process) After the milk is pasteurized it is immediately cooled to 40°F or lower

Proper pasteurization destroys any pathogenic organisms which might be present

in the milk, without appreciably affecting its nutritive value. The process was first used in 1860-1864 by Louis Pasteur of France in experiments to prevent the spoilage of wine.

A process of elimination from milk, skim milk, cream and other dairy products, organisms harmful to human beings. The method was devised to check fermentation.

See "Trends in Milk Pasteurization" in Handbook, P. 84.

Pasteurization, Objections to—Even though it is generally accepted as highly desirable, a few objections have been raised to pasteurization. 1. That it does, at least, partially destroy Vitamin C and some of the B group. Since milk is not very rich in these vitamins and since they can so easily be supplied in vegetables and citrus fruits and since much of the Vitamin C is destroyed by exposure to copper and the present practice at least to some extent, of removing oxygen by de-aeration process, this objection should not be considered of too much importance.

Other objections are that the practice of pasteurization would tend to discourage the usual strict sanitary precautions as regards health of cows and the health of employees and sanitary handling of the milk. Obviously, pasteurization should be considered an added precaution and should not in any sense be considered a substitute for recommended health measures.

Come-up Time Pasteurization—A term applied to describe a pasteurization process in which there is no intended holding time. The temperature is increased to the point where the lethality of the come-up portion of the heating cycle is great enough to insure adequate pasteurization. The process is characterized by heating times of one half second or shorter and temperatures above 175° F.

See "Trends in Milk Pasteurization" in Handbook, P. 84.

Continuous Flow Pasteurization—See H.T.-S.T. Pasteurization and Continuous Flow Holder.

Electric Treatment in Pasteurizing Milk—This treatment has been experimented with to considerable extent, the milk passing over carbon electrodes. Most of the pasteurizers planned on this principle use the flash system and the temperature of the milk is measured at the outlet of the heating chamber and there is an automatic control system which maintains the tem-

perature at the required height. This system was not accepted by health authorities until a flow-diversion valve had been properly incorporated in the holding unit so that if the milk failed to reach the required temperature it was promptly diverted back to the receiving tank. In this form the electric treatment has been accepted and is being used to considerable extent.

Electro-Pure Process—A method of pasteurizing known as high temperature-short time whereby every particle of the fluid is heated to a temperature of 160°F., or above and maintained at that temperature for at least 15 seconds. Electro-Pure, as implied by its name, uses electricity, and although not widely known until recent years, electric pasteurization is not a new idea. A complete history would be too lengthy but it is interesting to note that electric pasteurization was performed in England by J. M. Beattie and F. C. Lewis as early as 1911, and that in 1914 two electric pasteurizers were in operation in the U.S.

The early electric pasteurizers showed the need for automatic control and a means to prevent under-heated milk from being bottled. Eventually a pasteurizer incorporating a constant rate of flow, an automatic electrical temperature control and a contact thermometer was replaced by the present flow diversion valve.

This is said to be the first H.T.S.T. pasteurizer and probably led to the development of the present compact and efficient plate type units.

Flash Pasteurization—Same as High Temperature-Short Time Pasteurization.

High Temperature-Short Time Pasteurization (H.T.S.T.)—The process of heating every particle of milk or milk product to at least 160°F., and holding at such temperature for at least 15 seconds in approved and properly operated equipment. Some states require a slightly higher temperature. Heating and cooling are very rapid. Undoubtedly the most practical, efficient and economical large scale method of pasteurizing available at present. Also known as Continuous Flow and Flash Pasteurization.

Pasteurization, In-the-bottle—A system of pasteurization in which the milk is pasteurized and cooled after it has been put into the bottles. The milk is usually heated

by passing sprays of hot water over the bottles although in some types of pasteurizers the bottles are heated by subjection to live steam or by immersion in vats containing hot water. Although the system offers the advantage of reducing danger of contamination after pasteurization it is not used to any extent for the reason that it is slow. It also requires considerable floor space the cost of heat is greater a more expensive cap is necessary and the bottle breakage is greater.

In England an in bottle pasteurizer of a continuous type is employed with milk filled into crown-seal capped bottles.

Pasteurization of Milk in the Home—When it is not possible to obtain milk from a safe source or in the farm home or any home where raw milk is produced or purchased pasteurization to assure a safe milk for family use can easily be accomplished by use of modern practically automatic electrically controlled pasteurizers now on the market. These machines are equipped with time and temperature controls for accurate pasteurization.

However the simplest apparatus for home pasteurization consists of a double boiler used with or without a thermometer. One to two quarts of milk are put into a double boiler and covered then placed over one quart of vigorously boiling water in the bottom part and boiled for 10 minutes then cooled quickly by placing the top of double boiler containing the hot milk in a pan of cold water changing the water frequently until milk is cooled. Then it should be stored well covered in refrigerator or other cool clean place.

Pasteurization Substitutes—Many of those who have been objecting to pasteurization have proposed the use of ultra-violet radiation and ultra-sonic vibration and radio frequency heating. There is very little data as to the desirability or efficiency of these methods. One method of electrical treatment known as the "Electro-pure" is really due to the heat produced by electricity and is efficient in proportion to the amount of heat developed by the process. See Pasteurization by Electro Pure Method.

Regeneration System—A heat exchange system which effects a saving of heat and refrigeration costs in a dairy plant by allowing the incoming cold milk to cool the outgoing pasteurized milk, and vice versa. The system may be either one of two gen-

eral types: 1. Milk to milk regeneration. 2. Milk to water to milk regeneration.

"Shocking"—A method of pasteurizing sufficient to kill or retard a goodly portion of bacteria present in milk. Sometimes used to permit cultures to gain the ascendancy.

Stassanlung—A regenerative enclosed method of pasteurizing milk in order to kill harmful organisms and preserve the quality of the milk. The milk is heated to 167°F under slight pressure in a thin layer between two heated surfaces in order that all the carbonic acid may be retained. It is claimed that there is practically no milk stone formation, less destruction of vitamins, no evaporation of milk and more economy in steam utilization than in the more recognized methods of pasteurization. The device was invented by Dr. Iffenti Stassano of Italy and has undergone several changes and improvements after test at the Danish Experimental Dairy in Silkeborg, Denmark.

This method of pasteurization is much used in Europe but not in the United States.

Ultra-Sonic Pasteurization—This method has not proven very successful. Some experiments indicated that it could be relied on to destroy not over 75% or 82% of germs.

Cavitation i.e., the creation of a vacuum and the formation of small bubbles may play a part in homogenizing and emulsifying milk by the ultra-sonic vibrations method.

Pasteurizer—A machine used for the pasteurization of milk. Pasteurizers are of many types. For a more adequate description see Batch Heaters, Continuous Flow Heaters, Batch Holders, Continuous Flow Holders, In-The-Bottle Pasteurizers, High Temperature Short Time Pasteurizers, Plate Type Pasteurizers.

Plate Type Pasteurizer—A pasteurizer in which the milk passes between heavy gasketed plates that are held together by parallel bars and pressure.

Stainless steel is now exclusively used in that part of the pasteurizer that comes in contact with the milk. The use of this plate type heat exchanger is now almost universal with High Temperature Short Time pasteurization. In this pasteurizer the milk flows through the plate in ribbons about 1¼" wide and 11/32" thick. The cold milk is heated by regeneration

first to 110°F. and then to 140°F. The temperature of the milk is raised to 160°F. in the first 4 heating plates. Then it passes through a plate which completes the holding period of 15 seconds. The pasteurized milk is then cooled to 65°F. by the regenerative process, and is finally cooled to its low point in the last plates refrigerated with ice water.

Plate Type Pre-heater (Flash internal tubular)—A plate-type pre-heater whereby the milk goes from the heater through the filter under pressure. The milk passes from the filter through a second heating unit where it is heated to a higher temperature and through a sanitary pipeline to the holding vats at pasteurizing temperature.

Roswell Pasteurizer—One of the newer types of H.T.S.T. pasteurizers now on the market. It has been accepted by the United States Public Health Service for the pasteurization of milk and milk products at a temperature of 200°F. with a calculated holding time of 3 seconds.

Spray Pasteurizer—See Spray Vat.

Sterilization of Milk, Flash—This method has been made practical by a combination of the Dole Engineering Aseptic Canning System and a special milking and handling technique developed by Graves. The process seems to have three main advantages over the usual in-the-can sterilization.

Flash sterilization is said to produce better flavor, vitamin content, color and texture than has been accomplished by the older processes. Good quality seems to be constant irrespective of size of container. Since the milk is only subjected to flash heat it has no chance to develop the usual overcooked flavor.

Uperization—A heat treatment method used by the Swiss in sterilizing milk. By this process steam is forced into the milk under pressure to heat the milk to approximately 150°C. Later this added water is removed by evaporation in a vacuum tank.

X-Ray Treatment of Milk—While experiments have shown that X-Ray treatment of milk can sterilize milk without leaving any objectionable taste, the fact that it is very expensive and requires over thirty minutes in time seems to indicate that this method is not practical as compared

with H.T.S.T. pasteurization now readily available at most plants.

Vacreator (Vacuum Pasteurizer)—A special type of pasteurizer developed in New Zealand. Its makers say that it is primarily for pasteurizing cream and eliminating weedy and other undesirable feed flavors as well as bacteria. In many sections of the U. S. also being used to eliminate off flavors in milk.

See Vacreated Cream.

SEPARATORS

Centrifugal Separator—A machine designed for separating cream from milk and operating on the principle of centrifugal force. The centrifugal force generated by the rapidly revolving bowl overcomes the force of gravity, and the heavier liquid which is the skim milk is driven from the center of the bowl with greater force than the lighter liquid, the fat. Thus, two vertical layers are formed, the outer layer being skim milk, while the inner layer is cream. The cream and skim milk are then automatically discharged through their respective outlets.

Air-tight Separator—Many factory size cream separators have been greatly improved by constructing them so that no air can enter the bowl or come in contact with the milk during separation.

Centrifugal Separation—The separation of cream from milk by use of the principle of centrifugal force.

Centrifuge—A machine for separating, by rotation, a liquid as cream from milk and bacteria from a liquid.

"Cold-milk Separators"—The ideal temperature for separating milk is approximately 85°-100°F. but modern developments in the manufacture of separators have developed cold-milk separators that are quite efficient as regards close-skimming.

Cream Screw—A small adjustable screw on the bowl of centrifugal separators for regulating the proportion of cream to skim milk, which in turn adjusts the butter-fat test of the cream under any standard of condition.

Eiserner Trommel—A German term referring to one of the earliest made cream separators by Lefeldt in 1874. It was known as the Iron Bowl Separator. The apparatus consisted of a shaft which rotated two suspended pails of milk. After a few min-

utes of whirling the machine was stopped and the cream removed by hand from the top of the pail

Gravity Separation—The separation of cream from milk by the force of gravity as compared with centrifugal force. The milk is set in a cool place until most of the fat has risen to the surface forming a layer of cream. The fat rises because it is lighter than the other constituents of milk. After the cream has risen it is drawn off by any one of the following methods

1 **Deep Setting Milk Separation**—A gravity method of separating cream from milk. The milk is poured into a shot-gun type can about 8 inches in diameter and 18 to 25 inches in height. This is set in very cold water. At the end of 24 hours the cream has risen to the top and is secured by drawing off the skim milk through a faucet in the bottom of the can leaving the cream and a small amount of milk in the can or it may be skimmed from the top of the can

2 **Shallow Pan Method**—A gravity method of separating cream from milk. Fresh milk is poured into a shallow pan about 4" deep. After remaining in a cool place for about 36 hrs the cream which has risen to the surface is skimmed off with a spoon or ladle. This method was in use before the days of cream separators but is now used only by persons having just a few cows. Now considered obsolete

3 **Water Dilution Method**—A gravity method of separating cream from milk. Milk is placed in a can with faucet in bottom, and is diluted with equal parts of clean warm water and set in a cool place for about 12 hours after which time the skim milk is drawn from the bottom of the can. The addition of water lowers the viscosity of the milk and permits the fat globules to rise more rapidly to the surface. Also known as the hydraulic method of gravity separation. Used to considerable extent before the advent of the centrifugal separator but now obsolete

Hydraulic Cream Separator—A deep can with a faucet at the bottom. This can was once used in raising the cream in milk by dilution with water. Such an arrangement was also known as a ventilated cream separator. The system of separating cream in this way is known as the aquatic or water dilution method. Used to considerable extent before the advent of the centrifugal separator but now obsolete. See Water Dilution Method

Separator Float—In the dairy, this term usually refers to the mechanical device which fits into the receiving cup of the cream separator bowl and which regulates the flow of milk into the revolving bowl. When too much milk is flowing into the bowl the float rises and partly shuts off the outlet of the milk supply tank. If too little milk flows in the float recedes allowing a greater inflow of milk from the supply tank

Shot-Gun Can—A can holding from 16 to 18 qts used in separating cream by the gravity method. The can filled with milk is placed in a tank of cold water for from 24 to 36 hrs. The can is then taken out and the skim milk drawn off through a faucet at the bottom of the can. The cream layer may be seen through a glass gauge on the side of the can

Skim Milk Screw—See Cream Screw

Valve—A contrivance for controlling the motion of a liquid air or gas or loose bulk material along a passageway. It may be operated automatically or by hand. See also Refrigeration Valves

Flow Diversion Valve—A special device on HTST pasteurizers which automatically diverts the milk back into unpasteurized milk tank if it is not heated to the required temperature. This arrangement is required in most states

Flush Type Valve—A valve usually installed at the outlet in pasteurizing equipment to prevent the formation of a cold pocket or a dead end in which the milk would not be subjected to the heating process or to sufficient agitation to keep the temperature up to the required point during the holding period. This flush type valve is required by public health law on all holding type vats. The law specifies that this valve must be equipped for the detection of milk that might leak through the equipment in an improperly pasteurized condition. See Leak Detector Type Valve

Leak Detector Valve—A valve used in inlets and outlets of pasteurizing vats or other apparatus where a leak in the valve might result in some of the milk passing through the apparatus without being heated or held the required length of time. With the use of leak-detector valves if any milk does leak it will drop on the floor. They are essential to good pasteurizing

Milk Temperature Controller—An air-electric-actuated instrument that generates either a flow-diversion valve or milk pump automatically, preventing the milk from leaving the holders at below legal temperatures.

Vat—A large tank used in holding or processing milk or other dairy products.

Coil Vat—A vat for pasteurization of dairy products, in which heat and agitation are supplied by a revolving coil containing the heating medium. Coil vats are generally rectangular-shaped with the coil hung horizontally but some are square or cylindrical in shape and have a coil hung vertically. These vats are generally considered unsatisfactory for processing market milk because of features which make cleaning and sanitizing difficult. Now more or less obsolete although used in many small plants.

Vats (Jacketed) with Agitators—Jacketed vats with agitators used in the United States are generally made either of stainless steel or glass-enameled steel. Glass-lined vats are made of steel with a glass-coated inner surface. The glass-lined vat is surrounded with another steel vat which is covered with insulating material. Either a motor-driven agitator suspended in the vat through the cover or an agitator connected with a motor-driven shaft that passes through the side of the vat near the bottom is used. Milk is heated by hot water or steam passing into the space between the two tanks. Moderate agitation is ensured by using curved agitator blades and to prevent excessive heating, agitation is continuous during heating and holding.

Spray Vat—A narrow, rectangular-shaped vat for pasteurizing milk and cream. The milk or cream is heated by forcing hot water in sprays around the outer surface of the vat. Used in many small plants.

Viscolization—In dairying, the pumping of milk or cream through a viscolizer at high pressure. The liquid is forced between two ground surfaces of the viscolizing valve, resulting in a division and dispersion of the fat globules. Essentially homogenization.

Viscolizer—Like a homogenizer it employs positive piston pumps to force the mix at high pressure through a minute valve opening. The principal difference between these machines is not in effect produced but in the size of the aperture through which the mixture passes. A pressure of

2000 lb. in the viscolizer is equal to approximately 3000 lb. in the homogenizer.

End of Milk Processing and Processing Equipment.

Mineralized Milk—See Mineralization of Milk.

Modified Milk—Cow's milk modified in composition so as to more nearly approach the composition of human milk. This modification is sometimes necessary in the feeding of infants and certain invalids since cow's milk contains much more protein and mineral matter but only about half as much sugar as human milk. Milk is generally modified under a physician's direction. Usually the fresh, high grade cow's milk is diluted with water to decrease the protein content, and cream and lactose are added.

Milk Flour—See Nonfat Dry Milk and Milk Powder.

Multi-Vitamin Milk—A term used for milk which has been fortified with essential vitamins and minerals. As advertised by some companies each quart supplies minimum daily requirements of Vitamin A, Vitamin B₁, B₂, and Niacin, Vitamin D, Calcium and Phosphorus, Iron and Iodine.

Protein Milk—A specially prepared infant food which is ordinary milk to which dehydrated casein has been added.

Proteins of Milk (Ultimate)

Composition of

	Casein %	Lactalbumin %	Lactoglobulin %
Carbon	53.50	52.51	51.88
Hydrogen	7.13	7.10	6.96
Nitrogen	15.80	15.43	15.44
Sulphur	.72	1.92	0.86
Phosphorus	.71	trace	1.24
Oxygen (by difference)	22.14	23.04	24.61

Raw Milk—Milk which has not been subjected to any heat treatment such as pasteurization or processed in any other way. Therefore any objectionable bacteria which it may contain have not been destroyed.

Reconstituted Milk—Whole milk powder or nonfat milk powder to which has been added the required amount of water (the amount of water to be used is stated on the package of milk powder). The mixture is placed in a container and shaken vig-

ously or mixed with an egg beater. If any undissolved lumps remain the mixture should be strained. It should be chilled in the refrigerator still well and served as ordinary milk.

Milk of fluid composition may also be reconstituted from plain condensed and evaporated milk either whole or skim milk by the addition of a proper quantity of water.

Reconstructed Milk—See Reconstituted Milk

Separator Milk—Milk from which nearly all the fat has been removed by centrifrifugal force.

Serum of Milk—The clear liquid obtained from milk by removing the fat and casein in whole milk without the fat and casein. That which is commonly called whey.

Serum Proteins—The proteins remaining in milk serum after removal of the casein by precipitation with rennet or by adjustment of the pH to 4.6.

The serum proteins consist of a mixture of at least eight different proteins. They comprise 0.6–0.7% of cow's milk. See Constituents of Milk Reference Section P 285.

Skim Milk—Milk from which most of the fat has been removed. Legally the removal of any of the fat from milk results in a product which is skim milk, often called fat free milk.

U.S. Standards "That portion of milk which remains after removal of the cream in whole or in part."

Skim Milk, Composition of, Average

	Separator Skimmed	Hand Skimmed
Water	90.35%	90.35%
Protein	3.72%	3.58%
Fat	.01 .03%	.075%
Lactose	4.98%	4.66%
Mineral Matter	0.80%	0.76%

Skim Milk, Products Made from—Acid Precipitated Casein Bakers Cheese Bakery Products Bristles Buttermilk Cultured Chocolate Milk Concentrated Sour Skim Milk, Condensed Milk—Plain and Sweetened Confections Cottage Cheese Dried Skim Milk, Dry Mixer Feed for Animals Fiber Glue Ice Cream Low Lactose Skim Milk Paint Paper-Coating Plastics Pot Cheese Rennet Casein Skim Milk Cheddar Cheese

Soft Curd Milk—Normal cow's milk which on coagulation with pepsin or rennin forms a curd that is soft and clabbery in consistency as contrasted with the tough subbery curd obtained from most cow's milk. The softness of curd is determined by the A.M.S.A. approved method. Milk should be below 30 grams curd tension in order to qualify as soft curd milk. Homogenized milk should be under 20 grams curd tension. A high calcium or casein content increases the hardness of the curd while the addition of citrates and phosphates alkalinity heat and homogenization decrease the curd tension. The removal of fat causes a harder curd tension. The degree of softness of curd is a characteristic of individual cows and is retained permanently. Holsteins and Ayrshires generally produce a softer curd milk than do Jerseys and Guernseys. The average herd range is from 50 to 90 grams. Soft curd milk is generally claimed to be much more easily digested by infants and invalids than regular cow's milk.

Sterilized Milk—In general this term is given to milk that has been heated to a temperature of 212°F or higher for a length of time sufficient to kill organisms present. Theoretically this is not accurate for some germs will survive this treatment.

(U.S. Standards)—"Sterilized milk is milk that has been heated at the temperature of boiling water or higher for a length of time sufficient to kill all organisms present."

Vitamin D Milk—Milk in which the normal concentration of vitamin D has been raised usually to 400 IU per quart by one of the accepted methods of fortification.

Whey—The watery part of milk separated from the more thick or coagulated part or curd especially in the process of making cheese contains all the milk sugar and some of the minerals.

Whey, Products Made from—Acetone Acrylic Plastics Bakery Products Butyl Alcohol, Candy Cheese and Processed Cheese Cheese Spreads Coating Ethyl Alcohol Feed Food Acidulant Foods—Infant Hydrolyzed Lactose Syrup Lactic Acid Lactose Penicillin Pills Protein Hydrolyzates Resins Riboflavin Concentrates Soups Spirit Vinegar Tanning Whey Butter Whey Cream Whey Dried Whey Drinks Whey Condensed Plain Whey Condensed Sweetened Whey Pasteurized Sweet and Whey Protein

Whole Milk—Milk as it is drawn from the cow, including both the fore milk and strippings as differentiated from skim milk, buttermilk, etc.

End of Milk & Cream

Milk-Borne Diseases and Prevention of—Milk-borne diseases of human origin such as diphtheria, infantile diarrhea, paratyphoid fever, scarlet fever, septic sore throat, tuberculosis, typhoid fever and undulant fever, the germs of which are often milk-borne can best be prevented by having the milk supply carefully supervised by health-minded experts and by seeing that no one with communicable diseases has anything to do with the milking or processing of milk or other dairy products. Also no glass bottles should be accepted for return in places where there are contagious diseases. A careful check should be kept on cows to see that they are free from Tuberculosis, Brucellosis and other diseases that can be transmitted to man. See Cattle Diseases in Handbook Section, P. 247.

Milk-Borne Epidemic—The spread of disease by milk to a point where the number of cases in a community is above normal expectancy. Milk-borne epidemics have certain recognizable characteristics as follows: 1. The onset is usually sudden and widespread. 2. The infected patients are often all on the route of one milk man, particularly in the early stages of the epidemic.

Milk Bottle Gage Method—See Dairy Tests.

Milk Can Jacket—Thick heavy canvas coverings usually filled with some good insulating material such as animal hair. These so-called jackets are made in such a way as to slip easily over milk cans. They are used to protect the milk and cream in the cans from rising in temperature, especially when the cans are exposed to the heating influence of the sun and air.

Milk Chocolate, Sweet—This product may be made from the chocolate liquor by adding the necessary proportions of sugar, milk and cocoa butter, with or without vanilla flavoring. The blending of these ingredients requires a considerable amount of skill and special machinery.

Milk Contamination by Antibiotics and Pesticides—Residues of these drugs have been found in the milk from cows which have been exposed to them, according to surveys made by the Federal Food & Drug

Administration and may constitute adulteration within the meaning of the Federal Drug and Cosmetic Act. Persons selling such milk may be subject to prosecution under that law. Antibiotics such as penicillin and others which have gained access to the milk of cows treated for mastitis with these drugs, will prevent the proper growth of bacterial cultures of buttermilk, cheese, etc. There is also evidence that consumers of milk containing antibiotics may develop an immunity to these drugs. Then, in case of serious illness, where the use of these antibiotics might save their lives, these drugs would lose their effectiveness because of this immunity. Prevention lies in withholding from market for a 72 hour period all milk from cows treated with antibiotics. Take extra sanitary measures to prevent and control mastitis without the use of antibiotics. Pesticide contamination in milk can largely be prevented by using approved insecticides and following approved methods of applying them on forage crops and as sprays on cattle and buildings for control of insects.

Milk Control Board—State agencies created by State legislatures and authorized to license milk handlers, to fix minimum prices paid farmers for milk, to regulate relations between farmers and distributors and, in most instances, to fix the price charged consumers for milk. Their authority extends only to milk sheds that are within the State. State Control Boards may cooperate with the Federal Milk Administration in executing the Federal Marketing Agreements and Orders which deal with the same general problems. Federal officials usually act only in milk sheds involving two or more states (interstate trade) and they do not fix retail prices. Control Board members are appointed by the Governors of the states in which Control Boards have been created.

Milk Distributors (Milk Handlers)—People engaged in the business of collecting milk from farmers, pasteurizing and bottling it and then selling, and distributing it to consumers. Because of the perishable quality of milk as a food the milk distributor's job is one of the most exacting in the whole food industry. Distributors usually are commercial companies and can be classed under three groups—private commercial, the largest group; cooperative; and municipal.

Milk, Dried By-Products Of, and Their Use in Confections—See Handbook, P. 176.

Milk Ducts—Milk passages from the alveoli through the lobules lobes and milk cistern of the udder and through the teat

Milk Falacies—False ideas regarding milk some of which are: "Thunder sours milk." It does not but the warm atmosphere usually accompanying thunder storms makes milk more susceptible to souring because the bacteria which cause souring grow best in warm milk. If milk is properly refrigerated thunderstorms have no effect on it.

Milk or its products should not be eaten in combination with fish. No ground for this according to dietitians unless one or both foods are partially spoiled before they are combined.

Pasteurization spoils the taste of milk. Test taking has proved that perfectly pasteurized milk tastes like raw milk and cannot be distinguished from it.

"Milk is fattening." This is true only if milk is used to excess or in addition to a diet already high in calories. If used as part of a well-balanced diet it is not fattening.

"Milk is a perfect food." Milk does contain most of the nutrients needed for health—but not all—therefore it is not a perfect food but perhaps the most nearly perfect especially for the young. No one food product is a perfect food.

Milk Fat (Butterfat)—The fat found in milk is a mixture of mixed triglycerides. It contains significant amounts of at least sixteen different fatty acids ranging from four to twenty carbon atoms. It also contains the fat-soluble vitamins A and D and some cholesterol.

The well known saturated fatty acids in milk include Arachidic, Pityric, Capric, Caproic, Caprylic, Lauroic, Myristic, Palmitic and Stearic.

Of the polyunsaturated fatty acids in milk Arachidonic and Linoleic have been proved essential for growth of animals as has Linolenic acid found in vegetable oils. Among polyunsaturated fatty acids are Oleic, Deteronic, Palmitoleic, and Vaccenic. The more important of these fatty acids are described alphabetically.

See "Flavors in Milk" in Handbook, P. 69.

Milk Fever—See Diseases in Cattle.

Milk Flavor—Normal milk produced under proper conditions has a slightly sweet taste and a mild pleasant aromatic flavor and

aroma. Any deviation from the normal is classed as abnormal or off-flavor.

Milk for Manufacturing—Milk usually sold at a lower price to be manufactured into other forms of milk products like butter, cheese, ice cream, dry whole milk, dry skim milk. Compare "Fluid Milk."

See "Requirements For The Sanitary Production of Milk and Sweet Cream For Manufacturing" in Handbook.

Milk Goat—Several breeds of goats developed and raised principally for their milk, which is of practically the same composition as cows' milk, but is said to be more digestible because of the solubility of the curd.

Milk Grader or Platform Tester—A dairy trained operator stationed on a platform when milk is received and who checks by smell and taste the incoming milk to see if it is sweet and free from undesirable odors. Undesirable milk is rejected or diverted for other purposes.

Milk Hearings—Meetings held by the Federal Government or by State Milk Boards to which producers, distributors and consumers may come to discuss their side of the milk problem. Hearings are held before milk regulations and orders affecting the price and distribution of milk are issued.

Milk, How Utilized—See Reference Section P 233.

Milk in Bread Making—Nonfat milk solids (skim milk powder) is used very extensively by nearly all commercial breadmakers. While the amount used varies somewhat with different bakers approximately 6% calculated on the same basis as the weight of the flour is used. Nutritionists in general approve the use of milk in bread in as much as it increases the protein and mineral content and thus produces a more desirable food product. The use of milk powder also increases the riboflavin and B₆ vitamins considerably.

Milk in Improving the Nutritive Value of the Family Diet—See Handbook Section P 126.

Milk Inspectors—Persons specially trained in the testing of milk, and inspection of dairy farms and milk plants, who are appointed by federal, state or city authorities to check on the quality of the milk sold in areas assigned to them. They generally have the power to collect samples

for testing and to enforce standards for milk in their territory.

Milk Market Administrator—An official appointed by the Secretary of Agriculture to administer the terms and regulations of the Milk Marketing Agreements and Orders in milk sheds in which these are binding. In this work he may cooperate with the Control Boards in the various states involved in that specific milk shed over which he has jurisdiction.

Milk Marketing—See the following articles in the Handbook Section: "Marketing of Milk—From the Producer's Standpoint", "Milk Marketing Problems of Dealers or Distributors", "Milk From the Consumers' Point of View," P. 96, 104, 110.

Milk Marketing Agreement—See Marketing Agreement.

Milk Meters—Plant meters are of two types. One type measures the rate of flow of the milk. The second type measures the quantity of product. There is need of metering devices all the way from farm to processing plant. The meters on the market so far are not all that could be desired. The big problem seems to be how to eliminate air incorporation.

Milk Plant—A building equipped for handling milk. "Handling" in this case includes one or more of the following: Cooling, bottling, canning, pasteurizing, sterilizing, and some other processes. See Dairy.

Milk Plasma—The fluid of milk containing the proteins, sugar, minerals, and water; i.e., whole milk without the fat.

Milk Processing, Highlights Of—See Handbook, P. 46.

Milk Producer—A farmer who produces milk, i.e., milks cows, as the main part of his source of farm income, or as a side line to other farm operations.

Milk Production, Cost of—See Cost of Milk Production; Field Methods of Determining Cost of Milk Production and Formula Method of Determining Cost of Milk Production.

Milk Production—See Handbook Section.

Milk Products, Federal and State Standards For—See Reference Section, P. 290.

Milk Pump—A sanitary pump especially constructed for the elevation of fluid milk

products in dairy plants; that is, to raise milk or other fluids, such as cream, whey, ice cream mix, from vats or other containers on one floor to containers on a higher floor.

Milk Pump Cleaning—See (C.L.P.) and Handbook Section, P. 201.

Milk Records—On well managed dairy farms, records are kept regarding breeding, feed consumed, amount of milk produced and butterfat percentage and other records of cost accounting essential to good dairy farm management.

Well managed dairy manufacturing plants have elaborate cost accounting records covering all operations of manufacture and sale of their products.

Milk Replacements for Raising Calves—See Feeds and Feeding.

Milk Requirements—A term referring to the amount of milk which should be included in the daily diet in order to promote the highest state of nutritional well-being. The following standards have been set: A growing child— $\frac{3}{4}$ to 1 quart per day; An adult—1 pint or more per day; An expectant or nursing mother—1 quart per day.

Milk Ring Test for Brucellosis in Dairy Cattle—See Diseases in Cattle.

Milkroom—That place in the farm milking plant where the milk is strained, cooled and held until time for delivery, and where milking equipment may be cleaned and stored. Should be separate from but near to the milking room. If in a separate building it is called a milkhouse.

Milk Samples (How to Take and Preserve)—Milk samples are of no significance unless accurately taken. If the sample is taken for bacteriological purposes, special precautions must be taken to see that the containers and other equipment with which the milk comes in contact are sterile. Samples should always represent a fair average of the quantity to be examined. After the sample is taken it should be protected from light and stored under refrigeration, and generally the test should be made as soon as possible.

If the sample is for chemical analysis the precautions regarding light and temperatures are less important but special care must be taken to see that the quantity to be tested is thoroughly mixed by stirring and taking samples from different

parts of the vat Samples should be in a well stoppered bottle to prevent evaporation and if they are to stand sometime before chemical analysis is made a satisfactory preservative should be added

For testing milk for butterfat the sample must accurately represent the lot of milk or cream from which it was taken Since butterfat is its lightest constituent and quickly rises to the top care must be taken to see that the milk to be tested is thoroughly mixed before sampling Samples that are to be kept for some time before testing for fat should be carefully stoppered to prevent moisture evaporation *Potassium bichromate* and *mercuric chloride* are among the most satisfactory chemical preservatives to use Coloring material should of course be added to this highly poisonous compound so as to lessen the danger of samples being mistakenly used for food purposes

Milk Sanitation—The technique of producing clean wholesome safe milk in order to prevent the spread of milkborne diseases Because milk is an ideal food for germs of all kinds as well as for man great care needs to be taken to insure utmost cleanliness at every step in its production processing and distribution The body of regulations governing its cleanly or sanitary handling has been formulated by Health Authorities and their enforcement usually is entrusted to them These regulations are in the form of City County State and Federal laws and Ordinances which not only describe the conditions under which milk must be produced and processed but also provide for inspection service to see that the regulations are observed See Handbook Section

Milk Scale—A small spring scale used in weighing the milk from each milking of each cow for the purpose of making records of each cow's individual production The scale is graduated to 1/10 lb and has a capacity of 30 to 60 lb If the scale used has two adjustable hands one of which can be set at zero to balance the weight of the pail the reading may then be made directly when the filled pail is weighed

Milk Scum—A pellicle forming on the surface of hot milk in the open air The cause of the formation of scum is due chiefly to the drying of the upper layer of liquid

"Milk Secretion"—See Handbook P 46

Milk Secretion System—Comprised of the alveolus a very minute structure almost spherical in shape lined with a single layer of epithelial cells in which the milk is elaborated A number of these alveoli form lobules and several lobules form lobes Each lobe is drained by a single duct and these combine to form larger ducts and finally at some stage in the process of milking the milk in these ducts drains into the cistern of the milk gland This cistern is located directly above the teat At milking time the milk is drawn from the cistern through the milk duct in the teat called the teat canal or streak canal

Milk Shed—The area which supplies milk for a certain city or general consuming area Boundaries of a milkshed are usually determined by laws or regulations governing the inspection of farms which produce milk, i.e. if a certain farm does not meet inspection requirements of the city's health department that farm is not a part of the city's milkshed

Milk Sheet—A large printed sheet designed and ruled for easy recording of the amount of milk produced by each cow in the herd at each milking period during the month Can generally be secured from dairy supply houses or from the U S Dept of Agriculture

Milk Sickness—See Diseases in Cattle

Milk Solids—A rather indefinite term with many meanings It may have reference to total solids of milk or it may mean solids-not-fat The ice cream maker bases much of his calculations and operations on the nonfat milk solids The cheesemaker is much concerned with the solids of whey

Milk Solids Dry—See Milk Powder

Milk Solids Not Fat—See Milk Powder

Milk Standards—To protect the public against low testing milk adulteration and contamination definite milk standards have been adopted by federal state city and most town governments These milk standards usually state the minimum percentage of fat nonfat solids and total solids (T.S.) and the maximum bacteria content The federal standards apply only to milk sold in the District of Columbia and to interstate shipments There is a difference in various state standards The enforcement of these standards rests with federal state

city, and town milk inspectors, in cases within their respective jurisdictions.

Milk Standardization—It is a fairly common practice for milk distributors to standardize the fat content of milk so as to comply with state and federal standards and also to satisfy consumers, some of whom wish milk with low fat content. This standardization may be accomplished by mixing some high fat milk such as Guernsey with low fat milk, such as Holstein. Other distributors will add a certain amount of cream to accomplish the same results. In recent years people in general have become more diet conscious and because of an effort to reduce weight and also at the suggestion of physicians, are asking for food products with smaller quantities of fat.

Standardization also releases more milk fat for use in cream and ice cream making.

See **Pearson Square Method** for easy way of standardizing milk. For **Ratio of Concentration for Evaporated Milk**—See **Milk Processing and Processing Equipment**.

Milk Stone—An accumulated precipitate of milk proteins, fats, and minerals on metal dairy equipment or a combination of these substances with hard water salts and alkaline detergents. Milk stone may be prevented by using soft water, by rinsing all equipment with cold water immediately after use, and by avoiding excessively high temperatures. Milk stone is best removed by the use of organic acids, citric and acetic acid having been used with success. See **Handbook article, P. 185**.

Milk Stones (Calculus)—See **Diseases in Cattle**.

Milk Sugar—See **Lactose**.

Milk Tanks (Bulk-Cold Wall)—These refrigerated tanks are the latest development in milk cooling. They are generally used in connection with tank truck delivery and eliminate the use of milk cans.—May be either the direct expansion or the ice bank type.

See **"What We Have Learned About Bulk Tanks"** in **Handbook, P. 112**.

They are now generally accepted as the best and cheapest way of handling milk from farm to plant. In these tanks the milk is cooled immediately after it is milked and should not be permitted to warm up, either at the farm or during delivery to the plant. Where the herds

are large enough the cost of this method of cooling and delivering is lower than where cans are used. See **Handbook Section**.

Ice Bank Tanks—Many of the bulk milk tanks have a cold storage reservoir generally called ice bank, which seems to add considerably to their efficiency in that it gives considerable reserve refrigeration. Specifically it has been defined as a unit composed of three shells: an inner stainless steel shell designed to hold milk, an ice and water chamber, and an insulated shell. A small compressor builds ice to a predetermined level, and during the milk cooling process a pump circulates ice water against the inner shell in such a manner as to rapidly cool the milk.

Milk Thief—A hollow tube used to take a sample of milk from cans. The tube is inserted in the can of milk, the thumb is placed over the top of the tube, and the sample drawn out and then discharged into the sample bottle when thumb pressure is released.

Milk Transportation Facilities—Milk being a very perishable article requires speedy and refrigerated, transportation facilities for most satisfactory results. Insulated and refrigerated cars and automobile trucks are now in common use.

Milk, Utilization of—Milk is used in a variety of ways, much of it being consumed as fluid milk and much in the manufacture of ice cream, butter, cheese and a number of by-products. See **Handbook Section**.

"Milk Value As a Food" and "There Is a Sensible Way to Shed Pounds"—See **Handbook, P. 119, 133**.

Milk Veins—Two milk veins are located on either side of the cow's body just in front of the udder and extend along the underside just beneath the skin. The openings through which these veins pass to enter the body cavity are often termed milk wells. Generally there are two of these openings; however, in many cases instead of two there are a number of smaller openings. These veins are mistakenly called milk veins. They of course do not carry milk. They simply carry blood from the udder to the heart and lungs.

Milk Weights, How Estimated in Bulk Tanks—Milk is usually bought by weight and on the basis of butterfat content as indicated by Babcock test. In recent years, since much milk is stored in farm

cooling tanks these tanks are carefully made of certain definite cubic content and so arranged that a carefully calibrated dipstick dropped into the tank will give very accurate estimate of the milk in the tank. A carefully worked out calibration chart is generally furnished with the tank. Care must, of course, be used to see that the tank is carefully installed and stands level.

Milk is generally sold to the consumer in quarts, half-gallons and gallon containers. These may be of glass, plastic or cardboard.

Milk Well—The opening in the abdomen of the cow through which the vein (generally known as milk vein) passes on its way back to the heart.

Milking—The drawing of milk from the udder by hand or by a milking machine.

Milking Equipment—The equipment necessary for the proper milking of the herd. When a milking machine is used the milking job will be made easier if a rubber-tired platform truck is provided upon which all the necessary equipment and material needed is assembled. The equipment will include the milking units with at least one extra pail, two pails of water (one for washing the udders and the other for dipping the teat cups after each milking), a strip cup and a container for holding towels for washing and drying the udder.

Milking Frequency (Effects on Composition)—Experiments indicate the fat content of milk is higher the shorter the interval between milking.

Milking Machine—A mechanical device used for milking cows. The standard milking machines now on the market operate electrically on the vacuum or vacuum and pressure principle that is the milk is drawn from the udder of the cow by vacuum or by vacuum and pressure. All the different makes of machines use practically the same system of operation. There is considerable difference in construction but all models have pulsators operated by air pressure.

Milking, Managed—The proper milking of a cow by machine or hand in a short period of time (3 to 5 minutes) accomplished by preparing the cow's udder so as to obtain let-down of milk before milking is begun and of removing the ma-

chine as soon as the milk has stopped flowing.

Milking Parlor—A very modern addition to barn or milk house where milk is handled with extreme sanitary care. Usually the cows are led into special milking stalls or placed on a rotolator, a specially constructed revolving platform similar to a merry-go-round where they are milked automatically. Milking machines are employed and the milk is drawn from each cow separately into glass jars by vacuum. When a valve in the vacuum line is opened the milk is drawn out of the jars and delivered through a sanitary pipe line to the milk house then to be filtered, bottled and cooled.

Milking Shorthorn—A dual purpose breed of cattle that has been developed for milk production in the shorthorn breed yet many qualities desirable for beef animals have been maintained. The color is red, white and roan and the weight from 1200 to 1350 lb. See Handbook Section P 272.

Milking Shorthorn Society—An organization of breeders of milking shorthorns with the objective of registration and the promotion of the milking qualities of the breed. See Breed Associations.

Milking, Three Times Daily—Experiments have indicated that milking cows three times daily or oftener sometimes increases the yield but from an economic point of view counting high labor costs cows do not yield enough more to warrant the extra cost of operation.

Milking Tube—A hollow cylindrical instrument for insertion into the cow's teat when the teat is injured to the extent that milk cannot be extracted by ordinary milking methods. Without the use of a milking tube the proper healing of the injury may be prevented. Use of the tube is dangerous unless it is treated with surgical asepsis, i.e. thorough sterilization before using since infection may set in and cause mastitis.

Millets, Milfeed—See Feeds and Feeding.

Milling—In the dairy industry a step in the manufacture of Cheddar cheese where by the curd after cheddaring is passed through a curd mill which cuts the slabs of curd into small pieces of uniform size. The curd is milled in order to make salt ing more uniform to allow the escape of

they and undesirable gases and odors, and to facilitate washing the curd and filling the cheese hoops.

Milo—See Feeds and Feeding.

Milone—A German carbonated whey beverage.

Milorganite—Dried, activated sewage sludge produced by the Sewerage Commission of Milwaukee and used as fertilizer. It contains 4.1-6.4% nitrogen and 2.5-4% phosphoric acid.

Mineralization—As applied to milk, it is the addition to or fortification of milk with such minerals as iodine salts, iron, copper, and others which may be deemed lacking from the standpoint of a complete mineral food.

Also the conversion of an element that is immobilized in some organic combination or available form as a result of microbial decomposition.

Mineral (nutrition)—Any one of several chemical elements required in rather small quantities for the nutrition of plants and animals. The absence or lack of a sufficient quantity of any one of the necessary mineral elements results in abnormal development known as a deficiency disease.

Minimum Growth Temperature—Bact. The lowest temperature at which growth and multiplication of any given organism will take place. Compare Maximum and Optimum growth temperatures.

Minnesota Test—See Dairy Tests.

Minor Elements—Essential elements used in minor quantities by animals and plants. Secondary elements. They include magnesium, manganese, sulfur, zinc, copper, iron, boron, molybdenum, cobalt and others less well-known. See Trace Elements.

Mintztra Cheese—See Cheese.

Miscarriage—The failure of a female to carry her fetus to a normal birth; premature expulsion of a fetus.

Miscibility—The ability of two or more liquids to mix.

Mish-Mishshapen Cheese—See Cheese.

Mite—Any of numerous, small, often very minute creatures of the order *Acarina*, having a saclike body and usually four pairs of short legs in the adult. The mandibles are adapted for sucking or piercing.

They breathe through the skin or through tracheal tubes. Many are parasitic on insects or vertebrates, some on plants, on which they produce galls; others infest stored food products, such as cheese; others are aquatic.

Mitosis—Cell division in which there is a first dividing of the nucleus followed by the dividing of the cytoplasm; indirect cell division. Each chromosome doubles itself prior to division, one longitudinal half of each chromosome going to each daughter cell so that the number of chromosomes remains constant.

Mitzithra—Pot—See Cheese.

Mix—See Ice Cream Mix.

Mixed Concentrate Ration—A mixture of two or more grains or by-products. These may be home mixed or they may be purchased from a commercial feed company.

Mixing Dairy Rations—See Feeds and Feeding.

Modena—Monte—See Cheese.

Modified Accredited Areas—Towns, counties, or parts of counties in which the incidence of bovine tuberculosis has been reduced to less than 0.5% of the cattle according to official tests. Herds in these areas are accredited herds. Cattle from the circumscribed area may be shipped interstate without further tuberculin test.

Modified Babcock Test For Fat in Homogenized Milk—See Dairy Tests.

Modified Milk—See Milk and Cream.

Modified Wolf-Lehman Feeding Standard—See Feeding Standards.

Moisture Determination in Cheese—Quick test—See "Oil Test" and Heat Lamp Test.

Moisture Equivalent—The amount of moisture retained in a soil after that soil has been subjected to a force equal to 1000 times the force of gravity.

Moisture, Salt, And Fat Determination in Butter and Cheese—See Dairy Tests.

Moisture Test—See Dairy Tests.

Mojocchino Cheese—See Cheese.

Mojonnier Test (Fat)—See Dairy Tests.

Mojonnier Test (Total Solids)—See Dairy Tests.

Mojonnier Tester—A specially constructed machine for fat and total solids determinations in dairy products. It consists of an analytical balance hot plates vacuum drying ovens combined cooler and desiccator special type centrifuge motor and pump

Molar Solution—A solution containing one gram molecular weight of dissolved substance per liter of solution

Molasses—Molasses Feeds—Molasses Silage—See Feeds and Feeding

Mold—Any one of a large group of minute fungi which cause mold or moldiness also the deposit or growth produced by such fungi. The common molds are *Mucor* *Penicillium* *Rhizopus* and *Aspergillus*. Also the form in which anything is shaped as an ice cream mold and to form into a particular shape

Mold (cheese)—Mold Basket—See Cheese

Mold Growth, Prevention of—The most practical way to discourage mold growth is to reduce to the minimum the amount of air and humidity entering dairy products particularly cheese. The surface of cheese and the shelves on which they are placed may be treated with mild odorless disinfectants. A fairly satisfactory method is to rub the surface of the cheese with a mild propionic acid

Mold Inhibitors—Some antimycotic agents which have been used to prevent growth on consumers cuts of cheese are:

Propionic acid sodium propionate calcium propionate dimethyldichloro succinate, dehydroacetic acid*, sorbic acid ultra violet light methyl bromide penicillin aureomycin or sulfanil amide

Some of the above are used for dipping the cheese others are incorporated in the film or wax

* Not allowed by Food & Drug

Mold Powder—Mold Prevention by Ultra violet Light—See Cheese

Mold Preventive—See Dehydroacetic acid

Molding Surface—Moldy Flavor—See Cheese Defects

Moldy Nut Flavor—See Ice Cream Defects

Mole Drain—A drainage channel below the soil surface formed by drawing a pointed cylindrical metal plug through the soil

Molecule—A unit of matter, the smallest portion of an element or compound that retains chemical identity with the substance in mass

Molitorio—See Cheese

Molybdenum—See Trace elements

Momentum—The constant resisting force which would bring a moving body to rest in one second. Momentum equals mass times velocity in feet per second where mass equals weight in pounds divided by 32.16

Monantha Vetch—See Feeds and Feeding

Moncenisio—Mondseer Schachtelkäse—See Cheese

Monel Metal—A proprietary alloy containing approximately 67% nickel 28% copper and 5% iron and manganese. This alloy was once quite popular for use in dairy equipment but experience has shown that it is readily attacked by the weak organic acids in milk. The products of such attack are largely copper salts which exert an injurious effect upon the flavor and keeping quality of dairy products

Mongrel—The progeny resulting from the crossing originally of two now of several breeds as of domestic animals or sometimes of plants

Monilia—A type of mold usually forming a red pigment

Monocotyledons—A major division of the flowering plants including those species containing only one seed leaf

Mono-Lizer (Whitson's)—Ice Cream and sherbet stabilizer. Improves texture of products. Powder form. Odorless tasteless

Monosaccharide—A simple sugar, consisting of only one saccharide or sugar unit. Monosaccharides cannot be hydrolyzed and still retain the characteristics of a sugar. They are classified as trioses tetroses pentoses hexoses etc. on the basis of their number of carbon atoms

Monostorer—See Cheese

Monrad Rennet Test—See Dairy Tests

Montauo—Montavoner—Mont Cenis—Mont d'Or—Monthéry—Monterey—See Cheese

Moore Test—See Dairy Tests

Moraine—Undifferentiated, unconsolidated, usually stony material, deposited by a glacier.

Morning Milk—Morning milk is nearly always lower in fat than evening milk. The general reason seems to be attributed to the longer interval between afternoon and morning milking.

Morphology—That branch of biology which treats of the structural forms and mode of development of animals and plants.

Morrison Feeding Standard—See Feeding Standards.

Motility, Progressive—Similar to total motility, but used to express the percentage of sperm in a sample which are moving progressively forward.

Motility, Rate of—Used to indicate the average rate of movement of sperm in a sample of semen; i.e., the average speed with which they move.

Motility, Total—Used to express the amount of activity in a semen sample under the microscope. May be expressed as a percentage figure, or as a unit on a scale from one to ten.

Motor—A rotating machine which transforms electrical energy into mechanical energy.

Mottled—See Butter and Cheese Defects (Color in butter and Cheddar cheese).

Mould—British and Canadian designation for the organism such as *P. roquefortii*.

Mow—Hay stored in a barn; sheaves of grain or straw, etc., stowed in a barn. Also, the place in a barn for such stowing.

Mow Drying System—There are many systems both simple and elaborate, now being used for drying hay and grain. The most simple system for hay drying consists of tunnels, either of permanent installation or baled hay piled so as to have tunnel-like openings through which air can be forced by large electric fans (motor driven). The air is blown in until the hay is satisfactorily dry.

There are now several heat drying units which can be set up in special drying sheds where the hay can be satisfactorily dried over night while standing on trucks. After this initial drying the hay can be transferred to the hay mow the next day.

Many of these heat drying units are now especially adapted to the drying of corn. They are particularly valuable in the season when because of frosts or unfavorable drying weather, corn cannot be dried satisfactorily in the field.

Mozarindli-Mozarella-Mrsay—See Cheese.

Mucin—Any of a group of glycoproteins occurring in or made by glands, e.g., sub-maxillary gland and liver, containing a high percentage of carbohydrates; particularly mucic acid. The mucins form very hydrophilic colloids. Mucins are usually present in ropy or slimy milk.

Muck—Any kind of impure or decayed peat or black swamp earth, especially when used as manure. Dung in a moist state; manure.

Mucor—A mold which produces citric acid.

Mucosal Disease—See Diseases in Cattle.

Muenster-Standards—See Cheese.

Mulch—Any covering protecting the soil from excessive evaporation, water erosion, or wind erosion. Compost, manure, straw, paper, or other protective materials may be used.

Mulch, Dust—A thin top layer of dry, pulverized soil resulting from cultivation, the chief purpose of which is the conservation of moisture.

Mulch Farming—A system of farming in which the organic residues are not plowed into the ground but are left on the surface.

Mull-soy (Borden's)—Hypoallergenic soybean milk food for people allergic to cow's milk.

Multiparous—See Parous.

"Multipass" Condenser—See Horizontal Shell and Tube Condenser in Milk, Processing and Processing Equipment.

Multiple-compartment Holders—See Milk, Processing and Processing Equipment.

Multiple Cropping—The taking of two or more crops from the same field in one year.

Multiple-Effect Evaporators—See Milk, Processing and Processing Equipment.

Multiple Factors—As applied to genetics two or more factors all of which are needed to produce a maximum effect Two or more gene pairs or factors affecting the expression of the same character

Multiple Farm Operators—Farmers who operate more than one farm

Multi-service Package—See Ice Cream

Multi-vitamin Milk—See Milk and Cream

Mung Bean—See Feeds and Feeding

Munster Cheese—See Cheese

Muriated Potash—A chemical compound also called potassium chloride necessary for plant growth and often lacking in soils

Muriatic Acid—An old name for hydrochloric acid

Musty Flavor—See Butter Defects Milk and Cream Defects

Mutant—An individual the genotypic constitution of which differs from that of its parents and ancestors due to a definite change in the germ plasma not brought about by segregation or crossing over

Mutation—is the process by which a mutant is produced A sudden germinal variation that breeds true Such a variation is probably due to chemical alterations in the determiners or genes for certain characteristics in the germ cells of male or female or perhaps to a change in the number or arrangement of chromosomes themselves

Mutual Cooperation Condensery—Generally a farmer's cooperative association its purpose is to pool the milk of its members Every stock holder must be a milk producer and a patron of the condensery but every patron does not have to be a stock holder

Muzzle—The nose and projecting jaws of an animal as a cow

A fastening or covering for the mouth of an animal to prevent sucking and eating vicious biting etc

Mycelium—The vegetative body of a fungus composed of a mass of filaments called hyphae

Mycobacterium—A genus of bacteria characterized by slender rods gram positive and acid fast sometimes showing typical dichotomous (regularly dividing by pairs) branching The *tubercule bacillus* is a member of this group

Mycoderm—A fungus resembling the yeast plant in outward appearance, but producing little or no alcohol The mycoderm generally decomposes the alcohol formed by the true yeasts and when present in pressed yeast it weakens it and diminishes its commercial value It is probably one of the yeastlike plants to be found in dairy products especially in butter and condensed milk

Myristic Acid— $C_{17}H_{33}COOH$ A very slightly volatile saturated fatty acid found in butterfat to the extent of about 10%

Myristin—A milk fat forming about 20% of butterfat A combination of myristic acid and glycerol

Myost—See Cheese

N

Nageles — **Nagelkassa** — **Nan Tofu**—See Cheese

Nanny Goat—A female goat

Napier Grass—See Feeds and Feeding

Narrow Breeding—Breeding involving a restricted number of ancestors opposite to broad breeding

Narrow Ration—A feed ration containing a relatively large amount of protein as compared with the carbohydrates and fats

Natal Grass—See Feeds and Feeding

Natch—The rump of cattle

National Association of Artificial Breeders (N.A.A.B)—This organization was formed in 1946 and its membership includes practically all the artificial insemination organizations in the United States Canada and Puerto Rico Its headquarters are at Columbia Missouri "A I Digest" is the official publication of this organization

National Cheese Institute, Inc.—See Cheese

National Milk Producers' Association—An association made up of several smaller ones throughout the country, maintaining offices in Washington, D. C. Among the purposes of the association are: to find markets; arrange terms of sale; own and operate facilities for processing surplus milk or for assembling milk for fluid uses; and own and operate facilities for pasteurizing, bottling, and selling milk, cream and other dairy products at retail or wholesale or both.

National Research Council Standards—See Feeding Standards.

Native—A plant or animal living in a region of its origin. Not to be confused with naturalized.

Natural Erosion—Erosion of the natural landscape undisturbed by man or domestic animals.

Natural Refrigeration—Any system of refrigeration which uses ice or ice and salt as the refrigerant rather than compressed gases common to artificial refrigeration.

Natural Ripening—The process of allowing milk or cream to sour without the addition of a starter. Bacteria already present in the milk produce the changes, but off-flavors may be produced by undesirable microorganisms also commonly found in the milk, or which gain access to it during the ripening process.

Natural Starters—Portions of naturally soured clean-flavored milk, or skim milk, or cream, or buttermilk from a previous churning of good butter, added to the cream for buttermaking in an effort to control the development of flavor in the cream and in the butter made from it. Their bacterial content is varied and therefore results are uncertain. See Starters. Compare Pure Culture Starters.

Navel—A depression in the middle of the abdomen where the umbilical cord of the fetus was attached. The Umbilicus.

Navel Ills—See Diseases in Cattle.

Navy Beans—See Feeds and Feeding.

Neat—Cattle of the bovine kind as distinguished from horses, sheep and goats; an animal of the genus *Bos*.

Neatherd is a herdsman. **Neat House** is a shelter for cattle.

Neat's-foot Oil—A pale-yellow fixed oil made by boiling the feet and shin bones

of cattle, used chiefly as a leather dressing and fine lubricant.

Neat's Tongue—Ox tongue.

Neck Straps—A leather thong fastened around the neck of a cow or calf for identification and/or for fastening the animal.

Negative Balance—An animal is in negative balance when it is secreting and/or excreting more nutrients than it is receiving in its feed.

Nelson Filling Machine—See Cheese.

Nephelometric Method—A method by which cloudiness in a liquid is measured against a liquid whose cloudiness is due to a known quantity of the substance being determined.

Nessel Cheese—See Cheese.

Nests—See Cheese Defects (Swiss).

Nettle Rash—See Diseases in Cattle.

Neufchatel Cheese—See Cheese.

Neuter—A castrated animal; often refers to a castrated cat.

Neutral (soil)—A condition of the soil, neither acid nor alkaline but on the border line between the two. (pH 7.0)

Neutral Zone—In pasteurization of milk, the range in temperature which lies between the thermal death point of the hardest milk-borne bacterium and the point at which the cream line on the milk is injured.

Neutralization Period—The third period in the normal fermentation of milk. In the presence of considerable quantities of acid, most bacteria are checked. Molds and yeasts, however, usually will be present and flourish in the acid medium. The acid will be utilized by them, while other chemical changes producing alkaline by-products will accompany the reduction of acidity. A thick mat of mold often may be observed on the surface of the milk at this time. This process may involve several days or weeks. The sequence of events in the normal fermentation of milk may be divided into four periods, as follows: 1. "Germicidal." 2. Souring. 3. Neutralization. 4. Putrefaction.

Neutralization Precipitate of Milk—A precipitate of milk serum after the casein has been removed. It consists largely of phosphates which are precipitated by neutrali-

NEUTRALIZE

zation with some alkaline substance such as milk of lime (a suspension of $\text{Ca}(\text{OH})_2$ in water)

Neutralize—To remove the excess acidity from a dairy product, usually cream or ice cream mix. Cream which has soured is often neutralized before pasteurization and manufacture into butter or ice cream. Neutralization is practiced for the following reasons: 1 To improve the keeping quality of the product manufactured. 2 To minimize the production of undesirable flavors. 3 To avoid the excessive loss of fat that results from pasteurizing acid cream.

A dairy product should never be neutralized below the titratable acidity that is average and normal for the product, nor to a pH in excess of 7.0. Cream for butter making is generally neutralized to .25%. For detailed information see books on Buttermaking.

Neutralizer—1 Any substance with alkaline properties used in reducing the acidity of dairy products. The neutralizers used for reducing acidity belong to either of two basic classes of alkalies: (1) Lime and magnesium neutralizers. These consist of calcium or calcium and magnesium oxide. (2) Soda neutralizers. These consist of bicarbonate of soda (baking soda) or carbonate of soda (soda ash) or mixtures of these two. Lime neutralizers should be used in 10% solutions and soda products in 5% solutions.

2 An acid used to neutralize a base or a base used to neutralize an acid. In dairy work an alkaline solution is used to determine titratable acidity of dairy products while, in the determination of free caustic in washing solutions, an acid is used as the neutralizer.

Neutralizer Flavor—See Butter Cream and Milk Defects.

Neutralizer, Use of Lime—See Ice Cream and Buttermaking.

New York Board of Health Lactometer—An instrument used in determining the specific gravity and solids content of milk. Unlike the Quevenne lactometer, the New York Board of Health lactometer has no thermometer attached and its scale reads from 0 down to 120. This style of lactometer is not as widely used as the Quevenne.

Newman Lampert Stain—A combined solvent, fixing and methylene blue staining

solution used for the Breed smear in the direct microscopic count for bacteria in milk. The formula for the stain is as follows:

Methylene blue, certified	11.2 gm
Ethyl alcohol	54 cc
Tetrachlorethane tech	40 cc
Acetic acid, glacial	6 cc

The slides are dipped in this solution removed and dried before dipping in water to remove the excess stain.

NFE—See Nitrogen Free Extract.

NFDMS—Non Fat Dry Milk Solids. This term is now obsolete as Congress officially changes this to **NFDM** (Nonfat Dry Milk) in 1956.

Niacin (Nicotinic Acid)—See Vitamins.

Nick—In livestock breeding an animal superior to either parent, also the mating which produces such an offspring. Presumably brought about through epistatic gene action.

Nickel—A white metal which has been used with success in dairy equipment. Nickel is durable but does have some effect on the flavor of milk as it is slightly soluble in the acids of milk. Stainless steel is to be preferred.

"Nickel Milk"—Milk distributed to relief families during the depression at a price range from 4 to 6 cents a quart. The farmer sold milk at a low cost to a distributor who pasteurized, bottled and distributed the milk either wholesale to stores to be exchanged for relief tickets or delivered to homes by the regular home delivery method. All differences in cost were absorbed by the Surplus Marketing Administration.

Nicotinic Acid or Niacin—See Vitamins.

Nieheimer Cheese—See Cheese.

Night Soil—The human excrement used for manure deriving its name from the old custom of collecting it at night.

Nile Blue Sulfate—A basic oxazine dye of value as a biologic stain because of its property of staining fatty acids blue. Used as a 0.5% alcoholic solution or a 2% aqueous solution.

Nipper Teeth—The cutting teeth or incisors of a cow. There are eight of them located in the front lower jaw.

Nipple Pail—A pail for feeding milk to a young calf to which a nipple is attached through which the calf drinks. It has the advantages that the calf can be taught to drink easier than from an open pail, and drinking will be done more slowly.

Nissler Cheese (Niszler)—See Cheese Defects.

Nitrate—A salt, as potassium nitrate or sodium nitrate, used as a fertilizer. The oxidized form of nitrogen, NO_3 .

Nitrate of Ammonia—See Ammonium Nitrate.

Nitrate of Soda—See Sodium Nitrate.

Nitrate Reduction—The biological reduction of nitrates to the nitrite form.

Nitrate Test for Watered Milk—See Dairy Tests.

Nitrification—The act or process of oxidation of ammonia and nitrite compounds especially by bacteria, into the readily useful nitrate form of nitrogen. It occurs in all productive soils, in heaps of waste organic matter, etc., where nitrobacteria, the proper temperature, air, moisture, and alkalinity are present.

Nitrite—A salt, or ester of nitrous acid (HNO_2) as Sodium nitrite Na NO_2 . Certain bacteria have the ability of reducing nitrates in the dairy products to nitrites.

Nitrobacteria—Soil bacteria concerned with nitrification.

Nitro-casein—A characteristic yellow product obtained by treating casein with nitric acid.

Nitrogen—A colorless gaseous element, tasteless and odorless, composing by volume, about four-fifths of the atmosphere. It combines with other elements to form important fertilizing compounds. An essential element in protein formation.

Nitrogen Content—In chemical analysis the protein content of milk and other food products is determined by calculating the nitrogen content by Kjeldahl method and multiplying by 6.25. Slight plus corrections are generally made in calculating protein of casein and albumin.

Nitrogen Distribution—The analysis of the nitrogenous constituents of milk in terms of certain categories. The Rowland method

is widely used for this purpose. Results obtained by this method are of the following order of magnitude for fresh cows' milk:

	mgm/ 100 ml.	Percent of total
Total N	540	100
Casein N	430	79.5
Albumin N	43	8.0
Globulin N	19	3.5
Proteose-peptone N	18	3.0
Non-protein N	30	5.5

Nitrogen Fixation—The conversion of elemental nitrogen to organic combinations, or to forms readily utilizable in biological processes, by nitrogen-fixing microorganisms. When brought about by bacteria in the root nodules of leguminous plants it is spoken of as symbiotic; if by free-living microorganisms acting independently, it is referred to as nonsymbiotic fixation.

Nitrogen-fixing Bacteria—Those bacteria that can unit free atmospheric nitrogen with other elements to form chemical compounds such as ammonia, and nitrates or amino acids.

Nitrogen-Free Extract—In a feeding stuff, that part of the carbohydrates which is soluble and readily digestible. It includes the sugars, starches, pentoses, and non-nitrogenous organic acids, but not the crude fiber.

Node—In grasses, the point of the stem from which originate the leaf sheaf and branches.

Noekkelost, Nögelost—Non-acid milk—See Cheese.

No Grade Cheese—See Cheese.

Nonfat Dry Milk—See Milk, Processing and Processing Equipment.

Non-pathogenic Organisms—Microorganisms that do not produce disease.

Non>Returns—The conventional method of measuring "fertility" in artificial breeding. If, after an original insemination, a cow is not reported for reinsemination within a certain designated period, she is considered a "non-return," and assumed to be pregnant. Correlation with pregnancy rate is high, but not perfect.

Non-Typical Flavor—See Ice Cream Defects.

Normal Fermentation—As applied to milk the normal souring of the milk in which lactic acid is the principal product

Normal Solution—A solution which contains one gram molecular weight of dissolved substance divided by the hydrogen equivalent of the substance per liter of solution

Nose Bag—A bag for feeding grain mash etc. to an animal it covers the nose and fastens on top of the head

Nostale Cheese—**Nottan Spino**—See Cheese

Novelties—See Ice Cream

"Nitroproxy"—A trade designation for 1-nitroproxy amino-4-nitro-benzene a benzene derivative and not a sugar fits sweetening properties were reported as 4000 times that of sucrose It is easily obtained in the pure state as crystals which are orange in color and very slightly soluble in water its use in ice cream should be subject to the same supervision and restriction as that placed on saccharin

Nubbin—Any small or imperfect ear of find an corn any imperfect or undeveloped fruit

Nubian—A breed of milk goat

Nucleus—An organ present in the protoplasm of most plant and animal cells and regarded as an essential agent in their constructive metabolism growth and reproduction and in the hereditary transmission of characters Usually located more or less centrally in the cell and contains the chromatin

Nulliparous—See Parous

Number Tags—See Identification of Cattle
An ear tag for identification of animals

Nurse Crop—A fast-growing companion crop seeded with the seeding of a slowly established crop such as oats with grass

Nut Meats and Nut Extracts—See Use in Ice Cream

Nutricola Method—A method of milking devised by Backhaus to protect the milk from dirt coming from the udder A water proof bag is tied on the udder and filled

with boric acid solution By pressure against the bag the operator brings the antiseptic solution in intimate contact with the skin of the udder This mechanism is cumbersome to use and experiments have proved that bacterial content of the milk has not been greatly reduced by this method in comparison with other methods of cleansing of the udder This method seems obsolete—many better methods are now available

Nutrient—A term applied to any food constituent or group of food constituents of the same general chemical composition that may aid in the support of animal life

Nutrient Retention—See Cheese

Nutrients, Plant—The essential minerals or materials necessary for growth and well being of plants

Nutrition—The sum of the processes by which an animal or plant absorbs or takes in and utilizes food substances

Nutritional Anemia—See Diseases in Cattle

Nutritive Ratio—The ratio between the digestible protein and digestible nutrients, other than the proteins (including the fat multiplied by 2.25)

Example—A feed has 8% digestible protein and 80% total digestible nutrients and so by subtracting eight from eighty the amount of nonnitrogenous nutrients would be secured which in this case is 72 The ratio of protein to non-nitrogenous nutrients would be 8 to 72 or 1 to 9 often expressed 1:9

Nutritive Value of Dairy Products—Milk is the most nearly perfect single food and it is also considered the one best food to improve the ordinary mixed diet. In the diet milk (and its products) is exceptionally valuable because of its calcium and protein and its vitamin content Summer milk is generally conceded slightly more valuable than winter milk because of its larger vitamin content

Nutrose—A caseinate of sodium formed by the action of the alkali upon dried casein It is soluble in water

Nuworld Cheese—See Cheese

Nymphomania—An abnormal condition in which follicles of the ovary grow to larger-than-normal size and fail to rupture or ovulate. (Cystic ovaries). These cysts produce large quantities of estrogens, inducing more or less constant estrus. Cattle exhibiting nymphomania are characterized by irregular short estrous cycles, frequent

riding of other animals, nervous disposition and eventually a heightened tail setting.

Nymphomaniac—A cow that is more or less constantly in heat. The milk yield of such a cow is lowered and its composition may be changed.

O

Oat Clippings—Oat Feed—See Feeds and Feeding.

Oat Flour—As used in the dairy—a specially prepared oat product flour having anti-oxidant properties. Used in ice cream and other dairy products to prevent oxidation of the fat, in states whose dairy laws do not prevent its use.

Oat Groats—Oat Hay—Oat Hulls—Oat Meal—Oat Mill Feed—Oats—Oats and Pea Silage—Oats and Pea Soiling Crop—Oat and Vetch Silage—See Feeds and Feeding.

Oatseed—The seed or grain of the oat.

Obligate Psychrophils—Organisms which grow best in cold temperatures—about 4°C. (39°F.) and show little or no growth at 30°C. (86°F.). Mostly marine forms.

Obligate Thermophiles—Thermophilic bacteria which cannot grow at temperatures as low as 37°C. (98.5°F.), and which also fail to grow at temperatures higher than a few degrees above 80°C. (176°F.).

Temperatures from 140-170°F. are required for growth.

Occlusion—In dairy chemistry, it has reference to the absorption of oxygen particularly in milk powder.

Offal—The parts of a butchered animal that are removed in dressing it. Generally has reference to the inedible parts, as the digestive tract, lungs, and feet, used as raw material for further manufacture mostly into inedible products.

Off Feed—A term often used in reference to the condition of loss of appetite in farm animals. The condition may be caused by various stomach disturbances and occurs particularly when cattle in the fattening pen are fed too heavily at start of the season.

Off-Flavor—See Abnormal Flavor.

Off Flavors in Ice Cream—See Ice Cream Defects.

Offgrade—Not up to grade; varying from an inferior to a standard grade.

Off Horse—Refers to the horse on the right hand side in a team.

Office of Experiment Stations—A federal department that administers grants to states and territories for agricultural research; co-ordinates department research internally and in relation to research of state and territorial experiment stations; supervises the Federal Experiment Station in Puerto Rico; and administers special research funds of the department. It helps originate, develop, and check dairy research projects in dairy departments of federally supported institutions.

Official Record or Test—A.R.O. (Advanced Registry Official)—A record attested to by some official body as being authentic. A milk production record or butterfat record authenticated by a state university, agricultural college, or experiment station. It is the duty of the person making the test to be present during each milking; to weigh the milk and certify as to its weight and the percentage of fat contained therein, as determined by testing samples of each period by the Babcock method. See Advanced Registration Testing.

Official Test—See Official Record.

Official Testing—Same as Advanced Registration.

Offspring—That which springs from an animal or plant as an individual reproducing its kind; progeny; issue.

Ohm—Unit for measuring resistance to flow of an electric current. Corresponds somewhat to pipe friction in flow of fluids.

Ohm's Law Current = potential (electromotive force) — resistance

Oidium Lactis—A mold commonly found in sour milk butter cheese and other dairy products. The mold develops as a dull white, velvety layer, the greater part of the mycelium being submerged beneath the surface of the medium. It is characterized by dichotomous branching. It is thought necessary for the production of flavor in Camembert cheese. A member of a genus of fungi called *Candida*.

Oil Cake—**Oil Meal**—See Feeds and Feeding

Oil of Cassia—See Ice Cream

Oil of Orange—A fruit flavor obtained by expression or by alcoholic extraction from the fresh orange peel.

Oil Off Period—See Cheese

Oil Test for Moisture—**Quick Test**—See Dairy Tests

Oiling Off—See Milk and Cream Defects

Oiling Off Test For Cream—See Dairy Tests

Oilstone—A whetstone used with oil.

Only Flavor—See Butter Cream and Milk Defects

Ola Cheese—See Cheese

Old Cream Flavor—See Butter and Ice Cream Defects

Old Heidelberg—See Cheese

Old Ingredient Flavor—See Ice Cream Defects

Oleic Acid— $C_{18}H_{34}O_2$. The principal unsaturated fatty acid of butterfat present to the extent of 20-40%. Variations in oleic acid content are associated with the feed consumed by the cow. Oleic acid has one double bond in the center of the molecule. The development of a tallowy flavor in dairy products is usually caused by oxidation of this acid.

Oleo—Short for Oleomargarine. See Margarine.

Oleomargarine—See Margarine.

Oleomargarine, Determination of—See Foam Test.

Oleo Oil—A yellow oil of buttery consistency expressed from certain animal fats (esp. the high grade of beef tallow known as premier jus) the greater portion of the solid fat (oleo stearin) being left behind. It is used in making oleomargarine.

Oligosaccharide—A sugar consisting of a few monosaccharide units (2, 3, or 4) into which it can be split by hydrolysis.

Olivet—**Almötzer Quargel**—See Cheese.

"Omeira"—See Fermented Milk.

Onion or Garlic Flavor—See Butter Defects.

Oögenesis—The process by which ripe germ cells are produced by the female.

Oospore—A group of molds in which the oospore or the egg cell is large and rich in food material. The male cell very much smaller penetrates and fertilizes the oöspore which then develops into a thick-walled resting spore. The very destructive downy mildews belong to this group. It is one of the molds affecting dairy products.

Open—In stock breeding an animal not pregnant.

"Open" Base Plan in Milk Marketing—Under this plan each milk producer may establish a new milk quota or base every year. No restriction is placed on the quantity of whole milk which he may market nor on the number of producers selling in any given market. It places a premium on producers who furnish the highest percentage of surplus milk during the season of low production. See also "Closed" Base Plan, and Basic Surplus Plan.

Open Formula Feeds—See Feeds and Feeding.

Open Market—A market open to all buyers and sellers.

Openness—See Cheese Defects (Texture).

Ophthalmia—A severe often purulent conjunctivitis—inflammation of the deeper structure of the eye.

Ophthalmic Test for Bovine Tuberculosis—The ophthalmic test consists of placing tuberculin in the eye. If the animal has T.B. it is shown by a rather characteristic inflammatory reaction in the tissue of the eye. If the animal does not have T.B. there should be no marked effect shown. This

test is used only as a way of confirming one of the other tests.

Optical Rotation—The ability of a compound containing one or more optically active centers, such as an asymmetric carbon atom combined with four different groups, to rotate plane polarized light to either the right (dextrorotatory) or the left (levorotatory). This property is usually expressed as the specific optical rotation, $(\alpha)/\lambda$, calculated as follows:

$$(\alpha)/\lambda = \frac{\alpha}{lc} \text{ where } \alpha = \text{observed rotation in angular degrees}$$

l = length of light path in decimeters

c = concentration of solution in grams/ml.

t = temperature

λ = wave length of light

Optical Rotation and Optical Activity—Optical Activity consists in changing plane of polarized light. Optical rotation is the rotation of the plane of polarization of light in passing through an optically active substance such as dextrose sugar or quartz. If polarized light is visualized as being analogous to waves travelling away along a rope which is being jerked up and down at one end, a gradual change in the direction in which the parts of the rope vibrate as viewed farther and farther along (from up and down to 45° to the vertical to sideways) would correspond to the result of optical activity on light.

Optimum—The most favorable of any given set of conditions.

Optimum Growth Temperature—Bact. The temperature at which any given organism grows most rapidly. Based on optimum growth temperature, bacteria are divided into three groups, viz: *Thermophiles* or heat-loving; *Mesophiles* or moderation-loving; *Psychrophiles* or cold-loving.

Optimum Water Content of the Soil—That water content which is best for plant growth.

Orchard Grass—See Feeds and Feeding.

Order—Biologically, a category of classification ranking above family and below the class.

Organic Acids—Acids released or formed by the decay of organic matter or by the action of living plants.

Organic Fertilizer—Any plant food of plant or animal origin as animal manure, fish

meal, blood meal, tankage, cottonseed meal, compost, etc.

Organic Matter—Any material which was once a part of a living organism, either plant or animal.

Organic Phosphorus—Phosphorus present as a constituent of an organic compound or a group of organic compounds. Examples: glycerophosphoric acid, inositol phosphoric acid, cytidylic acid.

Organic Soils—Soils composed chiefly of organic matter, such as muck soils, peat soils, etc.

Organisms, Soil—The microscopic flora and fauna of the soil.

Organoleptic Properties—Refer to properties detected by the sense of smell and taste, thus dairy products are largely judged by organoleptic method.

Organosol—A colloidal system with an organic liquid as the dispersion medium.

Origin and Development of Buttermaking—See Handbook Section, P. 138.

Origination—The creation of a new plant variety, or breed of animals.

Orotic Acid—A non-protein nitrogenous substance present in milk to the extent of 50-100 mg. per liter.

Oschtjepek, Oschtjepka—See Cheese.

Osmosis—The diffusion which proceeds through a membrane, especially a semi-permeable membrane, separating two liquid solutions and which tends to equalize their concentrations. Living cells characteristically have semi-permeable membranes and depend upon osmosis for much of their activity.

Osmotic Pressure—Pressure produced by diffusion through semi-permeable membranes separating solutions (or a solution and a solvent) which tends to equalize their concentration, more molecules migrating through the membrane in one direction than in the other creating a pressure difference.

Osmotic Shock—Unfavorable reaction of sperm cells to change in concentration or composition of medium.

Osetin Cheese—See Cheese.

Osteomalacia—A name applied to disease of rickets when found in adults, which

causes a gradual softening of bone See Rickets

Ostertag System—A system originated in Germany for ridding herds of tuberculous cattle. It is based on clinical examination instead of tuberculin testing. All animals showing lesions on clinical examination are slaughtered. This system removes only advanced cases from herds on the theory that infection is spread chiefly by the latter and that infection from early cases is so slight as to be negligible. Not as successful as the Bang system and now obsolete.

Outbreeding—Breeding or mating of individuals stocks etc. which are relatively unrelated. A common practice in breeding. It consists of selection on the basis of individual excellence. The opposite of inbreeding.

Out-Crossing—The mating of entirely unrelated individual animals but within the same breed.

Outlet Box—A terminal box for electric wiring or fittings at which the wires terminate for connections to electric fixtures or appliances.

Outline of the Buttermaking Process—See Handbook Section, P. 117.

Ovarian Follicle—Sacs or pockets which form in the body of the ovary in which the egg ripens or matures. The follicle also contains a fluid mainly consisting of estrogen. Also known as a graafian follicle.

Ovaries, Cystic—Ovaries with cysts.

Ovary—The essential female reproductive organ in which the eggs are produced. In vertebrates there are commonly two ovaries; in birds only one ovary usually is functional.

The ovary has an endocrine function secreting estrogens from the follicles and progesterone from the corpus luteum. These hormones are involved in the expression of estrus, functional changes of the uterus and mammary development.

Oven, Sir Cheese—See Cheese.

Overcrop—1. An earmark for cattle in which a piece is cut off from the upper side of an animal's ear.

2. To exhaust the fertility of soil by excessive production.

Overflow Type Dilution Bottle Filler—An apparatus which fills dilution bottles with water to be used in bacteriological examination of milk and its derivative products. It consists of a glass cylindrical glass tubing rubber stopper, and pinch cock. It is made up of a special automatic overflow glass measuring cylinder, a $1\frac{1}{4}$ " to $\frac{1}{4}$ " reducing coupling that has been especially machined to accommodate the glass cylinder, a 3-way air cock valve and the necessary pipe nipple and fittings.

Overgraze—To graze pastures or grazing areas to excess.

Overliming—The application of too much lime to a soil causing certain detrimental chemical reactions such as deficiencies in available iron, manganese, copper, zinc or boron.

Overrun, Control of in Ices—Overrun in Ice Cream—Overrun, Per cent of—See Ice Cream.

Overrun, Determining the amount of—See Ice Cream and Butter.

Overrun, Final—Overrun, Plant—See Butter.

Overrun in Butter—See Butter. Overrun.

Overrun in Dairying—A common term used to describe the increase in volume of a manufactured product such as the increase in butter over the amount of butterfat used in the churning process due to the incorporation of additional water and the increase of ice cream over the amount of ice cream mix due to the incorporation of air.

Oversetting—See Cheese Defects (Swiss).

Oviduct—Same as Fallopian tube. One of the pair of fine ducts leading to the ovaries and forming a passageway for the egg (ovum).

Ovulation—Extrusion of the ovum from the ovary. Rupture of the mature ovarian follicle with release of the contained ovum.

Ovum (pl. ova)—The egg or female sexual cell produced in the ovary, which when fertilized by the male sperm in the uterus of the female develops into a new individual.

Ovum or Embryo Transplantation—The transplantation of a fertilized ovum or egg from the uterus of one animal into the uterus of another. The object of this experimental work, like artificial insemination,

tion, is to greatly increase the offspring from high-producing cows. So far it has been most successfully practiced with sheep. See Placenta Breeding.

Ox—The domestic bovine quadruped, especially an adult castrated male (which is used for a draft animal or for food). Not applied to the individual female, or cow.

Ox Ball—A hair ball from an ox's stomach.

Oxidase—An older term for dehydrogenase. See Dehydrogenase.

Oxidation—The process of oxidizing—adding oxygen to a substance or taking away hydrogen. Also a reaction involving the loss of electrons. See Defects in Dairy Products.

Oxidation-Reduction Potential—Eh. A measure of the tendency of a substance to give up or to take up electrons.

$$E_a = E_o + \frac{RT}{NF} \ln \frac{[OX]}{[Red]}$$

Where:

E_o = standard oxidation reduction potential, a characteristic of the system

R = the gas constant (1.99 cal/degree C.)

T = absolute temperature

N = number of equivalents of electrons transferred

F = the quantity of electricity per equivalent (96,500 coulombs)

[OX] = Concentration of oxidized form (moles/liter)

[Red] = Concentration of reduced form (moles/liter)

Oxidize—To cause to combine with oxygen, or to lose electrons.

Oxidized Flavor—See Butter Defects, and Milk and Cream Defects.

Oxygen—O₂. An element occurring free as a colorless, odorless, tasteless gas in the atmosphere, which is absolutely essential to plant and animal life. Oxygen is the most abundant of all elements on the earth's surface. The oxygen content of milk in equilibrium with the atmosphere is of the order of 7.5 mg. per liter.

Oxytocin (let-down hormone)—A hormone secreted by the pituitary gland, situated at the base of the brain, which causes the cow to "let down" her milk when the proper stimulus is applied. The pituitary gland secretes this hormone for only a few minutes, so it is necessary that milking take place quickly after the "let down" occurs.

Ozone—O₃. When oxygen gas is subjected to the influence of a silent electric discharge, it is converted into what is called an allotropic state (existing in two or more different forms) and becomes ozone. Ozone is a pale blue gas which is a powerful oxidizing agent. Ozone is present in minute amounts especially in the upper region of the atmosphere. Produced commercially, it is used for sterilizing water, purifying air and for bleaching. It has a faint smell of chlorine.

P

Packaging Cheese—See Cheese.

Packaging Ice Cream—Packaging Machines—See Ice Cream.

Packing House—A factory where meats, dairy products, or fruits, etc., are packed for transportation, refrigeration, preservation, etc.

Packing (in Cheese)—See Cheese.

Packing Plant By-Products—See Feeds and Feeding.

Packing Stock Butter—See Butter.

Paddock—A small field or enclosure for pasturing livestock, often near a stable.

Paglia—Pago—See Cheese.

Paint Poisoning—See Lead Poisoning.

Pakice—A method of refrigerating bottled milk during delivery. Water is first sprayed against the inside of a vertical barrel refrigerated with ammonia; the ice is scraped off as a slush by revolving scrapers, dropped into a bin to drain off the excess water, and then placed in sacks for icing bottle crates or to be compressed into briquettes for direct icing of the crates.

Palatability—A term of great importance in the grading and merchandizing of dairy products. It comprises the general appear-

ance aroma taste and flavor of these products such as milk, butter cheese and ice cream

Palea—The upper bract which with the lemma encloses the flower in grasses

Paletize—To stack on a pallet as ice cream packages by automatic machinery

Palmitic Acid— $C_{16}H_{32}O_2$ A non volatile saturated fatty acid found in butter fat to the extent of about 2, 30%

Palmitin—A fat forming about 2, 5% of ordinary butterfat It is a combination of palmitic acid and glycerol

Palmitoleic Acid— $C_{17}H_{32}O_2$ An unsaturated fatty acid present in milk fat to the extent of 3-4%

Palm Kernel Oil Cake—**Palm Kernel Oil Meal**—**Palm Middlings**—See Feeds and Feeding

Palpation—Feeling a surface with the trained hand to determine the condition of a normal or diseased organ such as the udder or internal organs

Pan—See Vacuum Pan

Pancreas—A complex organ associated with the digestive tract which secretes the pancreatic juice composed of digestive enzymes It also produces the hormone insulin an internal secretion which is involved in carbohydrate metabolism

Pancreatic Juice—A clear alkaline secretion coming from the pancreas It contains enzymes lipase or steapsin (fat-splitting) enzyme amylase a starch digestion enzyme and trypsin and myosin two enzymes which aid in the digestion of proteins Also an enzyme emulsifying neutral fats and a milk curdling enzyme

Pancreatins refers to anyone of the enzymes of the pancreatic juice or a mixture of them but generally is applied to the proteolytic enzymes trypsin and myosin

Pannarone, **Stracchino di Gorgonzola bianco** **Gorgonzola dolce**—See Cheese

Pantothenic Acid—See Vitamins

Papilloma—See Diseases in Cattle

Para Grass—See Feeds and Feeding

Para-amino Benzoic Acid—See Vitamins

Paracasein—The form of casein which is formed by rennin when milk is treated with rennet as contrasted to an acid casein or hydrogen caseinate Paracasein has twice the base-combining power of acid casein which has resulted in a number of theories (See Rennin Coagulation-theories)

Paraffin—A waxy substance produced in distilled wood shale or coal and occurring also in the earth as a constituent of petroleum or as a solid deposit Pure paraffin is colorless or white tasteless and odorless It is a complex mixture of hydrocarbons, chiefly of the methane series

Paraffin Defects—See Cheese Defects (Flavor and Appearance)

Paraffin Tank—See Cheese

Parafilm—**Parakote**—See Cheese

Paralyzer—A term which has been suggested to designate a substance which injures or inhibits the action of enzymes or other catalysts

Parameter—Range of variations An arbitrary or independent variable through whose function other variables may be expressed

Paraphenylene Diamine Test—See Dairy Tests

Parasite—A plant or animal living on in or with some other living organism (called its host) at whose expense it is maintained There are several kinds of parasites some living inside some outside and some injurious or fatal while others do little or no harm Examples are: dodder fleas lice intestinal worms pathogenic bacteria certain fungi etc.

Parathyroid Glands—Four small ovoid (eggshaped) glands near or embedded in the thyroid glands composed of cells arranged in irregular columns The glands elaborate an internal secretion (Parathyroid hormone) which is most important in regulating the concentration of calcium in the blood and the body Its extract (Parathormone) is a useful medicine in certain diseases as tetany

Paratyphoid Fever—A fever caused by certain members of the genus *Salmonella* particularly *Salmonella paratyphi* ("B paratyphosum A") and *Salmonella schottmulleri* ("B paratyphosum B"). The organisms are gram negative rods, non

sporulating and morphologically similar to the coli. Type A causes a slow fever while type B generally brings on violent intestinal disturbances often incorrectly diagnosed as ptomaine poisoning. Milk products, particularly liquid milk, are often responsible for outbreaks of this disease.

Parenica, Parenitza—See Cheese.

Parent Material—The material from which a soil has been formed.

Parlac (Borden's)—Spray process dry whole milk.

Parmesan Cheese—Composition of—See Cheese.

Parmigiano—See Cheese.

Parous—Said of females having produced one or more young, and also used in the following ways: Nulliparous—having produced no young. Uniparous—having borne one young, or an animal which produces one young at a time: e.g. the cow.

Biparous—having borne two young, or an animal which produces two young at a time: e.g. twins.

Multiparous—having borne more than one young, or producing more than one per pregnancy.

Parsnips—See Feeds and Feeding.

Parthenogenesis—Reproduction by means of the development of an unfertilized egg. It occurs chiefly in certain insects, as aphids, and low plant life, as certain algae and fungi.

Partnership Cropping—The growing simultaneously of two crops of about the same rate and season of growth, but of different habits and requirements as pole beans and corn, soybeans and corn, oats and field peas, etc.

Parturient Paresis—See Diseases in Cattle.

Parturition—The act of bringing forth young.

Pascal's Law—Briefly, the principle that a fluid transmits pressures equally in all directions or that the pressures in a fluid are the same at all points if not acted upon by external forces.

Passburg Process—See Milk, Processing and Processing Equipment.

Pasta Filata—See Cheese.

Pasteurellosis—See Diseases in Cattle.

Pasteurization—Pasteurization, In-the-bottle—Pasteurization, Objections to—Pasteurization Substitutes—See Milk, Processing and Processing Equipment.

Pasteurization of Milk for Cheesemaking—Since there is a possibility of some pathogenic bacteria surviving the ripening process in cheese, it seems that whenever possible milk for cheesemaking should be pasteurized.

Pasteurized Blended Cheese—Pasteurized Cheese—See Cheese.

Pasteurized Cream Butter—See Butter.

Pasteurized Milk—See Milk, Grades of.

Pasteurized Milk, Tests for—See Dairy Tests.

Pasteurizer—See Milk, Processing and Processing Equipment.

Pasteurizer Vat—A tank used for holding milk during pasteurization, or after pasteurization holding it at a certain temperature for a desired period.

Pasteurlac—A trade term describing the white tablet used in the short, vest pocket modification of the phosphatase test. When dissolved in distilled water, the tablet makes up the buffer substrate solution.

Pasturage—A term used to designate the forage derived from pastures.

Pasture Grass, Young—Most nutritious because it contains less lignin and crude fiber. See "Feeding the Dairy Cow" in Handbook Section, P. 1.

Pastures—Fields of vegetation (generally consisting of grasses and legumes) which are harvested directly by grazing animals.

Annual Pastures—those sown with an annual grass, or other forage crop—to last for only one grazing season—usually followed by row, or forage crops or by permanent pastures.

Permanent or perennial pastures are planned to be grazed from year to year—usually best if they are divided by fences to provide for rotation and strip grazing. Ground well prepared is seeded with a variety of grasses, legumes, etc. which have different growth periods and maturing dates, and thus provide good grazing the year round, or in the colder climates, during the entire grazing season. Also

any enclosed grazing acreage in which cattle are run from year to year See Rotation Pastures

Pasty Body—See Butter Cheese and Ice Cream Defects

Patchiness—A livestock term indicating fatty deposits about the tailhead and other parts of the body of animals particularly in the case of dairy and beef cattle that have been fitted for show This condition may be avoided by lightening the ration before the animal becomes too fat

Pate—In livestock the skin of a calf's head

Pathogenic Organisms—Disease producing microorganisms

Pathologist—A specialist in the study or treatment of disease

Patrick Test—See Dairy Tests

Paunch—First stomach of a cow See Rumen

Pea—Pea Cannery Waste—Pea Feed—Pea nuts—Peanut Hay—Peanut Oil Meal—Peanut Skins—See Feeds and Feeding

Pearl Disease—See Diseases in Cattle

Pearl Millet—See Feeds and Feeding

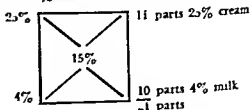
Pearson Square Method—An arithmetical method devised by Dr R. A. Pearson for use in standardizing milk, cream and ice cream mixes A square or rectangle is drawn and at the upper lefthand corner is placed the percentage of fat in the cream to be cut down and at the lower lefthand corner the percentage of fat in the milk to be used to reduce the fat in the cream In the center is placed the percentage of fat desired The figure in the center of the square is subtracted from that at the upper lefthand corner and the result placed at the lower righthand corner this being the number of parts of milk to be used in the standardizing The per cent of fat in the milk used is subtracted from the figure in the center and the result placed at the upper righthand corner this figure being the number of parts of cream to be used

The figure at the top right corner and lower right are added together and divided into the total number of pounds needed to find what one part equals The figure corresponding to one part is then multiplied in turn by each of these two figures

to give the number of pounds of cream and of milk to use in securing the standardized mix

Example

42 lb of 15% cream are desired
25% cream is available
4% milk is available



$$\begin{array}{r} 2 \text{ lb} \\ 21 \overline{) 42 \text{ lb}} \\ 10 \times 2 = 20 \text{ lb } 4\% \text{ milk} \\ 11 \times 2 = 22 \text{ lb } 25\% \text{ cream} \end{array}$$

Pea Sheller—A machine usually combined with a pea viner for removing peas from the pod

Pea Viner—A machine which removes pea pods from the vines Usually combined with a pea sheller

Pea Vine Silage—See Feeds and Feeding

Peat or Peat Moss—Partly decomposed plant life from bogs or some meadows. For use it is dug dried, usually compressed and graded Used as a stable litter for stock, for mixing with soil for placing around plants to hold moisture also for fuel charcoal etc.

Peat Soil—Matured soil containing over 50% organic matter

Peck—A unit of measure the fourth part of a bushel a dry measure of eight quarts. See Reference Section for Weights and Measures

Pecorino—Same as Romano See Cheese

Pectin—A by-product of the apple and citrus fruit industries used rather eaten solely in ices and sherbets but is not a very satisfactory stabilizer for ice cream Chemically it is a polymer consisting largely of galacturonic acid galactose and arabinose and is classified as a gum Purified sugar beet pectin forms a weaker and less brilliant gel than citrus pectin

Pedigree—A list or table showing an animal's line of ancestors and their relationship The term pedigree really includes only the record of ancestors but since there

are many animals with records of milk and butterfat, these are usually used as part of the pedigree.

Pedigree Filler—A misuse or subterfuge of the pedigree record of an animal. In selling cattle, for example, an unscrupulous owner, in order to build up the production story in a pedigree, may enter the records of distantly related animals. The animals with the records will not be found in the pedigree under consideration. This practice, of course, is unethical and abusive.

Pellet Methods—See Milk, Buttermilk.

Pelt—The skin and wool of a sheep and the skin of any fur bearing animal.

Pen—To enclose or confine in a small space.

A small enclosure for animals; also, the animals in one such enclosure, as a pen of sheep.

Pen Dairy Farming—A comparatively new system of dairy farming whereby a large number of dairy cows are handled entirely in pens and fed only such feeds as are brought to the feeding bunks or mangers in the pens or pen barns. See Zero Grazing.

Pencillaria Millet—See Feeds and Feeding.

Penetrometer—See Cheese.

Penicillin—See Antibiotics.

Penicillium—One of the most common molds, usually green in color. *P. roquefortii* is of importance in the making of Roquefort and other blue-veined cheese.

Penicillium Camemberti—A white mold which gives to Camembert cheese its characteristic flavor. This mold secretes an alkaline substance and a peptonizing enzyme; the latter diffuses into the curd, and produces the body of the cheese.

Penicillium Roquefortii Mold—Normally a blue-green mold which gives to Roquefort cheese its characteristic flavor. This mold grows best between 45-55°F. with a relative humidity of 85-90%, and at pH 4.8 to 5. It is salt tolerant, growing at levels as high as 4.5%. The mold must have oxygen for growth hence the punching of the cheese. These characteristics are utilized during the making of blue-veined cheese.

Penicillium Roquefortii—White Mutant of—See Nuworld Cheese, Dairy Microbiology, (molds).

Penis—The male organ of copulation.

Pennsylvania Pot Cheese—See Cheese.

"Penny Milk"—During the depression milk sold to the poor school children in New York City under a plan which involved cooperation between the Federal government, milk producers, and distributors. The amount of each unit sold was one-half pint. Under a special provision of the Federal Milk Marketing Order covering the sale of milk in the New York area, farmers could sell "penny milk" to distributors in the "200-mile zone" at 1.12 cents per ½ pint. New York dairies were asked to submit bids to the Federal Government, which, added to the penny each child paid, would cover the cost of giving the farmer his 1.12 cents, and shipping, processing, and delivering milk in ½ pint bottles to the schools. From funds appropriated by Congress for removal of surplus agricultural commodities, the Federal Government in effect made up the difference between the children's penny and the total received by distributors. An experiment carried on during October, November and December, 1940.

Pentelcu-Pepato, Sidiano Pepato—See Cheese.

Pepsin—The principal enzyme found in the gastric juice secreted by the stomach. It converts protein material into simpler compounds such as peptones and proteoses. Although it had often been found in combination with rennin, its independent identity was not established until Kleiner and Taube developed a rennin without peptic (digestive) activity, and also demonstrated that crystallized pepsin in proper dilution completely destroys extremely active, highly purified rennin. Preparations made from the stomachs of pigs and calves are often used in coagulating milk for cheesemaking.

Peptization—Chem. The production of a colloidal solution by finer dispersion of a coarser system.

Peptone—A mixture of albumoses and peptones derived from the digestion of protein by pepsin. Used as a constituent of bacteriological media.

Peptonization—See Proteolysis.

Peptonized—Said of that which is digested by a proteolytic ferment; converted to peptone. Ex: Curds of Milk (casein)

converted to peptone by the ferment trypan

Peptonizing Bacteria—Saprophytic bacteria in milk that liquefy the proteins

Per Capita Consumption—This phrase is used to indicate the average amount of any product used by each man woman and child of any given territory usually refers to annual consumption

Percolation—The downward movement of water through the soil under the force of gravity

Perennial—A plant that continues to live from year to year usually applied to herbaceous plants having roots that persist but stems that die down to the ground seasonally

Perfect Flowers—A flower having both male and female structures (stamens and pistil) in the same flower

Permanent Wilting Point—See Wilting Coefficient

Peroxidase—An enzyme which catalyzes the oxidation phenols and aromatic amines in the presence of hydrogen peroxide The peroxidase of milk (lactoperoxidase) constitutes about 0.2% of the total milk protein It is the only milk enzyme that has been prepared in a crystalline state

Pesticides—Chemicals such as insecticides fungicides plant hormones and related chemicals used in crop production and in control of pests on animals and in food products in food storage Fertilizers are not included See Milk Contamination by Antibiotics and Pesticides

Pest—Term applied to any markedly destructive insect or weed

Petit Carre Cheese—Petit Suisse Cheese—See Cheese

Petri Dish—A shallow flat circular glass dish with glass cover used for incubation of inoculated cultures in bacteriological work See Plate

Petroleum Ether—The fractional distillate from petroleum which boils at from 40° to 70°C (104.0-158.0°F) and has a specific gravity of 0.635 to 0.660 purified by washing with sulfuric acid then with soda and subsequent redistillation used as a volatile solvent Especially used in the Mojonnier test for butterfat in milk or cream

Plaudlerize, Plaudlerizer—To remove volatile flavors from cream by treating the cream with air under reduced pressure The Plaudlerizer, a machine used for this purpose and patented in 1929 caused the hot cream to explode upon entering the vacuum pan and the rapid removal of the volatile products by the vacuum suction expedited the expulsion of the off flavors that had been made volatile by heat The later use of steam injection in the place of heated air materially improved the efficiency of the machine

Pfister Cheese—See Cheese
pH—A number which designates degree of acidity or alkalinity by expressing the negative logarithm of the hydrogen ion concentration

See Acid Soil and Alkaline Soil
The logarithm of the reciprocal of the activity of the hydrogen ion in a solution formula expressed as follows

$$pH = \log \frac{1}{H^+}$$

The activity H^+ is the effective concentration of hydrogen ions in equivalents per liter

Expressed in different terminology it is an expression of the number of grams of hydrogen ions per liter of solution A pH of 7 represents true neutrality below pH 7 solutions are increasingly acid while above pH 7 they are increasingly alkaline The pH is measured on a scale (Sorensen scale) going from 0 to 14 Seven is the neutral point Below 7 is acid while above 7 on the scale is alkaline Each unit below 7 represents an intensity of acid which is 10 times as great as the unit above it while each unit above 7 represents an intensity of alkali which is 10 times as great as the unit below it

pH of Dairy Products

Product	pH
Normal milk	6.5-6.8
Milk from infected udders	7.0-7.2
Ice Cream mix	6.1-6.5
Condensed milk	6.0-6.3
Milk soured 0.15-0.25%	5.8

pH Determination of Cheese—See Dairy Tests

Phage—See Bacteriophage

Phagocytes—Cells which destroy bacteria etc in the blood stream They are white blood cells (leucocytes) and when engaged in the destruction of foreign matter are called phagocytes

Pharmacopoeia—A compilation (book) containing the names and descriptions of the accepted drugs, chemicals, etc. used in medicine, together with established tests and standards for their identity, strength, purity, and with formulas for making preparations from them. The U. S. Pharmacopoeia first edition appeared in 1820, has been revised every ten years by a committee of physicians and pharmacists, and was adopted as the legal Standard for the U. S. in the Foods and Drugs Act, June 30, 1906.

Phase

1. One of the stages in which a thing appears during the course of change:—as ice to water—to gas.

2. A homogeneous, distinct, separable portion which is separated from another distinct portion by well defined boundary. Phase in uniform circular motion is an angle giving the position of a particle (for example, each time a particle passed the bottom of a circle it would be said to be passing through the same phase); in wave motion two particles have the same phase when they have the same displacement and the same velocity, when they are one wave length apart (for example two crests would be in the same phase or two troughs).

Phase Inversion—Examples are the change of cream into butter; and milk is an emulsion of fat in milk serum.

Phenolphthalein—An indicator commonly used in the test for titratable acidity in dairy products. It is obtained from certain lichens and is prepared in powder form. Its use is based upon the fact that in acid solutions it is colorless, while in alkaline solutions it is pink. In the milk or cream acidity test, when enough alkali solution (N/10 sodium hydroxide) has been added to make the sample alkaline, the phenolphthalein present causes the sample to turn pink. Actually, while titrating milk or cream, using this compound as an indicator, the end-point, when reached, is not exactly neutral. The pH of the end-point is pH 8.3 or on the alkaline side. Phenolphthalein indicator is made up by dissolving ½ gram of dry phenolphthalein powder in 50 cc. of alcohol and making up to 100 cc. with distilled water.

Phenotype—As applied to genetics, an individual's constitution in regard to the visible characters, contrasted with genotype. In effect, the observed appearance

or function of an individual resulting from the interaction of that individual's genotype with its environment.

Phenylalanine— $C_9H_9O_2N$. An amino acid found in milk proteins. Casein contains about 5.0 gms. per 100 gms. and B-lactoglobulin about 3.5 gms. per 100 gms.

Philadelphia Cream Cheese—See Cheese.

Phosphatase—An enzyme which catalyzes the hydrolysis of esters of phosphoric acid. Milk contains at least two phosphatases, one exhibiting optimum activity at pH 9.5-10.0, the other at pH 4.0. The first enzyme is widely used as an indicator for pasteurization of milk.

Phosphatase Test—Phosphatase Test for Cheese—Phosphatase Test, Scharer Method of—See Dairy Tests.

Phosphate—A salt or ester of phosphoric acid, H_3PO_4 . Any phosphatic material used for fertilizers.

Phosphate Rock—Phosphate Ground Rock—Rock consisting of calcium phosphate in combination with other substances. Vast beds of it occur in the United States. The three main classes exploited are land rock, river rock, and the phosphate deposits of Tennessee, Florida and some western states. To be valuable as a fertilizer it should contain at least 50% of phosphate.

Phosphate rock, finely ground, is extensively used in some sections as a phosphate fertilizer. It contains from 25 to 33% phosphoric acid. The quantity of readily available phosphorus in soil is low, hence this material is most useful for fertilizing perennial plants, perennial hay, and pasture legumes and grasses.

Phosphate, Super—See Superphosphate.

Phosphatide—See Phospholipides.

Phospholipides—Fat-like substances containing phosphoric acid (ortho) and a nitrogenous base, such as lecithin, cephalin and sphingomyelin. They are present in milk in small quantities ranging from 0.03 to 0.18%. The phospholipides in milk are not only associated with the milk fat but exist almost quantitatively as a monomolecular layer on the fat globules. Important in forming emulsions, off flavor development, whipping ability of cream and ice cream, excessive foaming of skim milk, and are the mother substance in the development of fishy flavors in butter, due to tri-methyl amine.

Phosphomonoesterase Test—See Dairy Tests

Phosphoric Acids—A group of acids formed from phosphorus pentoxide (P_2O_5) by different degrees of hydration. They include orthophosphoric acid (H_3PO_4), metaphosphoric acid (HPO_3) and pyrophosphoric acid ($H_4P_2O_7$).

Salts and esters of orthophosphoric acid called orthophosphates occur in milk. Their amount is equivalent to about 1 gm of phosphorus per liter.

Metaphosphoric acid is used as a protein precipitant.

Phosphorus—An essential mineral needed in the ration of farm animals. Together with calcium it makes up three-fourths of the mineral matter of the entire body and over 90% of that in the skeleton and more than one-half the minerals in the milk. Phosphorus is also essential in many of the soft tissue and fluids of the body. It is a vital ingredient of the chief proteins of the nuclei of the cell and is found in many important compounds in the body.

Phosphorus Fixation—The conversion of soil phosphorus into a relatively unavailable form by mineral elements in the soil, notably iron and aluminum.

Photosynthesis—The process of manufacturing sugar in the green tissues of plants from water and carbon dioxide in the presence of light.

Phylum—One of the primary divisions of the animal or vegetable kingdom, so called because the members are assumed to have a common descent, a direct line of descent within any group.

Physics—The science of matter and motion, of the interactions of energy and matter.

Physiological Disease—A disease caused by disorganization of functions or of metabolism as would be brought about by extremes of temperature, oversupply of water, etc., but not associated with pathogenic organisms.

Physiology—That branch of the science of biology which deals with the normal vital functions of various parts of the living animal and plant organisms. Compare Morphology and Anatomy.

Physiology of Dairy Cattle—See Milk Secretion In Handbook P 46.

Phytosterol—One of the sterols present in vegetable fats and commonly used in the making of oleo. The difference in the melting point of this fat from that of butter fat is the basis for testing for adulteration of butter.

Pick Up—An attachment to a combine used for picking up grain left in the windrow.

A small automobile truck, sometimes a body interchangeable with the rear deck of a roadster.

Pick up Ruler—A ruler that picks up hay or straw from the swath or windrow in the field and bales it.

Pickled Cheese—See Cheese.

Picks—See Cheese Defects (Swiss).

Pie Cheese—Pie Cheese—See Cheese.

Pig—A young swine of either sex that has not reached sexual maturity, usually weighing under 130 pounds; also a swine of any age wild or domestic.

Piggery—A place where swine are kept or bred; a pigsty.

Pig Manure—The excrement of swine having an average composition of 0.55% nitrogen, 0.15% phosphoric acid and 0.4% potash. It is a cold manure and decomposes slowly.

Pigment—Any of various coloring materials in the cell or tissue in animals and plants. **Pigmentation**—Depositing of or coloration by pigment.

Piling—Pimento Cheese—Pimp Cheese—See Cheese.

Pin Holes—See Cheese Defects (Texture).

Pin-Point Colonies—Very minute colonies of bacteria on agar plates barely visible to the naked eye and appearing very small even under a hand lens. May be caused by any of the following: 1 Overcrowded plates 2 Heat-resistant streptococci 3 Thermophiles 4 Unfavorable reaction or media.

It is erroneously assumed that all pin-point colonies are thermophilic bacteria. As a matter of fact many of these colonies are not thermophilic in nature; instead they may be common streptococci. Deposits of milkstone on all equipment are a fre-

quent cause of pin-point colonies on plates prepared from pasteurized milk. Also known as punctiform colonies.

Pineal Body or Epiphysis—A small body or outgrowth of the brain, homologous to the pineal or median, unpaired eye of certain primitive reptiles. It is doubtful whether it normally possesses an endocrine function.

Pineapple Bran or Pulp—See Feeds and Feeding.

Pineapple Cheese—See Cheese.

Pink—See Cheese Defects.

Pink Eye—See Diseases in Cattle.

Pink Test—See Dairy Tests.

Pint—A measure of capacity, equal to half a quart in liquid or dry measure. It contains 16 fluid ounces.

Pinto Beans—See Feeds and Feeding.

Plora—See Cheese.

Pipe-joint Cement—A cement, as a mixture of red lead with linseed oil in a thick paste, for making a pipe joint impervious to leakage.

Pipeline Milking—In pipe-line milking or so, called milking parlors or milking sheds, the milk goes directly from the milking machines through sanitary pipes to the cooler or holding tank and sometimes directly to the bottle filler. Obviously by this process the milk does not come in contact with human hands at any stage of the operation.

Pipe Thread—A form of screw thread used on pipe and pipe fittings, characterized by a somewhat fine pitch and usually a tapering diameter.

Pipette—A small glass tube of certain capacity used for the measuring and transfer of liquids in chemical and bacteriological work. The liquid is drawn up into the tube by suction and retained by closing the upper end.

Pistil—The female structure in a flower, composed of a stigma, style, and ovary.

Pit—A covered excavation in a field for storing vegetables.

Pit Silo—See Silo, Pit.

Pitching Point—Pitching Tester—See Cheese.

Pituitary Gland—A small gland attached to the floor of the brain, found in all vertebrate forms and consisting of two lobes, one developing from the brain, the other from the roof of the mouth. The anterior lobe produces hormones which regulate growth, the thyroid and adrenal cortex, and govern the gonads and mammary secretion. The posterior lobe produces hormones involved in the regulation of blood pressure, kidney function and contraction of the smooth muscle of the uterus and mammary gland.

Pityriasis—See Diseases in Cattle.

Placenta—In most mammals, the vascular structure by which the fetus is nourished in the uterus. It is usually expelled after the young is born, constituting the chief part of the afterbirth. There is generally no admixture of maternal and fetal blood, but an interchange of the dissolved substances by diffusion. The fetus is attached to the placenta by the umbilical cord.

Placenta Breeding—See Ovum or Embryo Transplantation.

Plain—Level land; especially an extensive open field or broad stretch of land having few variations of surface. A term suggesting general inferiority; in livestock judging, coarse, lacking quality, inferior.

Plain-bred—Having in the pedigree few or none of the animals whose blood is most desired by breeders or purchasers at a given time.

Plain Condensed Milk (Whole or Skim)—**Plain Condensed Skim Milk**—See Milk, Processing and Processing Equipment.

Plant—Roughly defined, a vegetable as distinguished from an animal. No definite distinction between lower form of plant and animal life.

To put seeds or plants in the ground and cover, preparing for growth.

Plant, Dairy—A place where dairy products are received, processed, and/or sold.

Plantation—Usually a large group of plants or trees under cultivation; a grove. Also a large farm.

Planter—In Agriculture, a person who sows or plants. Also refers to a planting ma-

chine such as a corn potato or cotton or tobacco planter

Plant Food, Plant Food Ratio—Any food materials used by plants. Particularly any of various commercial products supplying the principal mineral nutrients of plants.

The relative percentages of nitrogen phosphoric acid and potash respectively in a fertilizer such as 5-10-5 (5% nitrogen 10% phosphoric acid 5% potash)

Plasma Solids—Nonfat dry milk i.e. proteins lactose salts and various minor constituents

Plasmon—A yellowish powder prepared by treatment of the curd precipitated from skim milk with sodium bicarbonate. The compound is kneaded in an atmosphere of carbon dioxide and reduced to a soluble powder—the sodium salt of casein.

Also a trade name for this casein preparation used as a food. See De lactosed Milk.

Plastic Cream—See Milk and Cream

Plastic State—Plasticizers—Plasticizing—See Cheese

Plastic Transparent Tubing—offers many advantages for certain Ice Cream Mix and milk installations such as 1 Operator can see if mix is flowing properly 2 Can often eliminate a lot of elbow joints which simplifies cleaning operation 3 Cost is less than stainless steel

Plastics—Plable manufactured materials which can be molded into various shapes. A number of plastic materials are made from casein and quite extensively used in industry. See Casein Plastics.

Plastid—Any of certain small bodies of specialized protoplasm of some cells especially plant cells and serving in many cases as organs or centers of special metabolic activities.

Plate—In bacteriology generally 1 A round shallow glass dish about 3½-4 in. in diameter with a cover of the same shape commonly known as a petri dish. It is used for incubating bacterial colonies upon any chosen nutrient media 2 The procedure followed in growing bacteria. See Petri Dish.

Plate Cooler and Pasteurizer—See Milk, Processing and Processing Equipment

Plate Count of Milk—This is one of the most accurate methods of estimating bac-

teria in milk. See Bacteriology Tests for details.

Plate Type Pasteurizer—See Milk, Processing and Processing Equipment

Plate Type Pre-heater—See Milk Processing and Processing Equipment

Pleomorphic—A term applied to bacteria having more than one form.

Pluofilm—See Cheese

Plow—A farm implement used to turn over or break up the soil. There are many types of plows such as the primitive walking plow followed by the horse drawn riding plow and in recent years the motorized disc rotary and shovel plows.

Plowshare—The name given to that part of the plow which cuts the furrow at the bottom and side.

Plow Sole—A layer of dense soil immediately below the plowed layer which is packed and commonly impervious to the rapid movement of water and nutrients.

Plug—The male fitting for making electrical connections by insertion in a receptacle or body.

A fuseplug for an electric circuit the plug consisting of a fuse in an Edison screw-shell body for the protection of circuits of 30-ampere capacity or less.

In machinery the piece in a cock which can be turned to permit or check the flow.

The piece of material removed by a punch in forming a hole, as in leather work.

To remove a small section (plug) from as to plug a cheese or tub of butter.

To close (a rivet) by hammering so as to cause it to fill the hole.

Any piece of wood metal or other substance used to stop or fill a hole.

Plum Island Animal Disease Laboratory—A new scientific research center which is located on Plum Island 1½ miles off Orient Point on the tip of Long Island New York. This center was dedicated in September 1936. Its facilities are devoted not only for further study of foot and mouth diseases but all other contagious and infectious diseases that threaten the livestock industry.

Plumb—Vertical straight up and down. A plumb line.

A small mass or weight, fastened to a string, and used by builders, to indicate a vertical direction; a plumb bob.

Plumb Level—A level consisting of a horizontal arm and a plumb line at right angles to the arm.

Ply—A fold, or twist or strand as of yarn. One of the veneer sheets forming plywood. Also, the number of layers or thicknesses in a fabric as one-ply, two ply, etc.

Plymouth Cheese Exchange—See Cheese.

Pneumatic—Using air or worked by compressed air. Adapted for holding compressed air as a pneumatic tire. Biologically, containing air; having cavities filled with air.

Pneumonia of Calves—See Diseases in Cattle.

Pocket Holders (Pasteurizers)—See Milk, Processes and Processing Equipment.

Pod—Botanically, a dry seed or fruit; an example, a legume as of the pea or bean.

Pod Corn—See Feeds and Feeding.

Podkwas—See Milk—Fermented.

Poise—The force required to produce a difference in the velocity of flow of a liquid of 1 cm. per second, when this force is exerted on 1 sq. cm. between two parallel planes, each 1 sq. cm. in area and 1 cm. apart.

Poison Ivy—Any of several American sumacs of somewhat vinelike habit, with trifoliate leaves, greenish flowers, white berries, and an irritant oil which renders the herbage poisonous to touch.

Poison Oak—See Poison Sumac.

Poison Sumac—An American sumac containing an oil which renders the herbage very poisonous to touch. It is a smooth shrub growing in swamps, with pinnate leaves, greenish flowers, white berries, which distinguish it from the closely allied, harmless, sumac which is red fruited.

Poisoning—See Food Poisoning. Handbook, P. 91.

Poke—A yoke with a pole inserted to prevent cattle from breaking through fence.

Polariscope—An instrument which measures the optical activity of such substances as sugars, certain acids, and oils.

It is used in determining the purity of a substance, i.e., to find whether it has been adulterated. The substance to be tested, commonly in the form of a liquid, or solution, is placed in a tube between a set of prisms—the polarizer and analyzer. The degree of rotation is read off on the scale attached to the analyzer, a yellow sodium flame usually being employed as a source of monochromatic light.

Pole Horse—A horse harnessed beside the pole; a wheeler in distinction from a leader.

Polenske Value—An expression used in chemistry designating the amount of volatile fatty acids, insoluble in water, that may be present in a fat or oil. It represents the number of cubic centimeters of 0.1 normal alkali required to neutralize the water insoluble, volatile fatty acids from 5 grams of fat. The Polenske value of butterfat is from 1.5 to 3.5. Other animal fats are much lower than this number, while vegetable oils like coconut oil are much higher.

Poll—In livestock—the top of the head of a cow between the horns. That part of the head which is composed of two bones rising immediately between the two ears of the animal. In a dehorned animal, the poll seems to rise like a dome from the head.

To cut off or cut short the hair, wool, etc.

An animal born without horns, or an animal with its horns removed.

Pollard—A hornless animal, as a cow or sheep. A coarse kind of bran obtained from wheat, and sometimes used for feeding stock.

Polled—Cattle without horns. Naturally hornless; a muley.

Polled Angus—See Aberdeen Angus.

Polled Durham—See Polled Shorthorn.

Polled Jersey—A dairy breed originating in Ohio prior to 1895. Two strains were developed: the single standard strain and the double standard strain. The type desired in the polled Jersey is identical with the horned Jersey in every respect but without horns.

Polled Shorthorn—A minor breed of hornless beef cattle often called polled Durham; developed from the shorthorn in

nd color red white and roan
: 1200 to 1400 lb

—The male element of flowering
and certain kinds of trees and
which combined with the ovule
le element) produces seeds. The pol
contained in the anther lobes gen
occurs in single grains of varying
form and color but most often ap
as a fine yellow dust easily wind
: or carried by insects

ate—To transfer pollen from the
ers of a flower to the stigma (con
ng the female element) of the same
ther flowers. Pollination may be car
on by man insects or wind

ation—See Dairy Wastes

novski & Martin Test—See Dairy

rel—See Cheese

disperse System—A colloidal solution
aining particles of different sizes

ethylene—A plastic material synthe
d from natural gas—has many uses in
dairy industry

heets of polyethylene are inert and do
dissolve or react to any constituents
milk. Polyethylene imparts no flavor
f it is moisture proof bags are made
ily from it formed from extruded
es. They are tough and do not tear
y easily. Closure may be accomplished
heat sealing much like that used for
lophane. They can also be sealed with
tie or clamp. Cottage cheese, cream
ese and many other products can be
caged with it.

lymer—Any one of two or more com
unds that have been formed by the
cess of polymerizing another com
und

See Pectin and Polysaccharide

olymenze—To change chemically as when
vo or more molecules of the same kind
mbine to form a more complex com
ound having the same elements in the
me proportion but with higher molec
lar weight and different physical prop
rties

olymyxin—See Antibiotics

olysaccharide—A polymer of sugar (sac
haride) units usually of high molecular

weight. Starch, glycogen and cellulose are
examples

Polythelia—The condition of having many
teats or nipples. See Supernumeraries

Polyunsaturated Fatty Acids—Those having
four or more hydrogen atoms missing leav
ing double bonds between two or more car
bon atoms. Those which are "essential" in
the diet because the body needs but cannot
make them are linoleic and linolenic acids
(present in vegetable oils unless completely
hydrogenated) and arachidonic acid (pres
ent in animal fats and oils). See Milk Fat

Polyvinyl Chloride Plastic Film—A tough
plastic film now commercially available is
to some extent used to enclose stacked
forage or silage material to exclude air
limit respiration and encourage desired fer
mentation. It can also be used as a water
proof plastic cover to shed rain and snow
to prevent drying out or excessive leaching
or loss of valuable feed or food nutrients.
Made by several commercial concerns.

Pooling System—A system of milk market
ing used often to help establish the price
of milk. The total returns from the sale
of milk during a given period of time
are divided by the total volume of milk.
In order to arrive at the average or pool
price. Every producer receives the same
price for his milk (subject to butterfat
transportation freight etc differentials).

Poona—See Cheese

Poorly Blended Flavors—See Ice Cream De
fects

Poppy Seed Oil Meal—See Feeds and
Feeding

Pore—A minute opening or orifice in an
animal or vegetable membrane for trans
piration absorption etc as the pores of
the sweat glands

Pore Space—That portion of a soil which
is not occupied by solid particles but by
either air or water

Port du Salut Cheese—See Cheese

Positive Balance—An animal is in positive
balance when it is consuming more nutri
ents than it is excreting and/or secreting

Pot Cheese—See Cheese

Potable—Suitable for drinking such as
pure water

Potash—One of the three major plant foods, noted for its stimulating effect in increasing vigor of plants. Chemically, it is the oxide of potassium, (K_2O).

Potassium—K. A. soft, light, silver-white metal of the alkali group, occurring abundantly in nature, but always combined. Potassium is present in milk to the extent of about 1.50 gms. per liter.

Potassium Bichromate ($K_2Cr_2O_7$)—Can be used to preserve milk for fat analysis but not for solids-not-fat.

Potassium Fixation—The process of converting exchangeable or water-soluble potassium to moderately available potassium to a form not easily exchanged from the soil complex with the cation of a neutral salt solution.

Potassium Hydroxide (Caustic potash)—KOH; a strong base widely used in chemical work. A hard, brittle, white, solid which is deliquescent and very soluble in water with the evolution of heat. The solution is very caustic, having a corrosive and disintegrating action upon animal and vegetable tissues. It is the most powerful of the ordinary bases. It is used in making soft soaps. Also used by the dairyman in stick form for checking the growth of horns on young calves.

Potato Cheese—See Cheese.

Potato Pulp, Dried—Potato Silage—Potatoes—See Feeds and Feeding.

Potent—In animals, having the power of procreation, generally thought to be strong and vigorous.

Potted Cheese—See Cheese.

Poulard Wheat—See Feeds and Feeding.

Pound—See Weights and Measures in Reference Section.

Poundal—The unit of force which, acting on a pound mass for one second, gives to it a velocity of 1 foot per second.

Pouring Platform—A platform with a roof over it built against the outside wall of a milk room where milk carried from the milking stable may be poured into an elevated receiving vat.

Powdered Milk—See Milk Powder.

Power—Power, in mechanism, is the product of force by distance divided by time,

or the performance of a given amount of work in a given time, and is expressed as inch-pounds per minute, foot-pounds per minute or second, etc. The term power is frequently used to designate a force. In connection with the so-called "mechanical power"—the lever, wheel and axle, wedge, screw, etc.—it is usual to speak of the applied force as the power; this is, however, not strictly correct, as power should always, in mechanics, be used in accordance with the definition given above.

Power Brush Washer (Small)—Bottle washer run by an electric motor or steam turbine. The washer consists of two rotary brushes for cleaning the inside, at the same time a third brush washes the outside.

Power Factor—A term expressing the ratio between the useful current in a circuit and the total current.

Power Room—A separate unit or room in a dairy plant which houses such power equipment as engines, compressors, well pumps, brine pumps, etc. Such a separate set-up provides easy access to machines for operation and repairs, and ready visibility of all gauges, motors, etc.

P.P.M. or ppm. means parts per million.

Practical Sterilization—The heating of food material or food containers to high temperatures so that the heated substances are rendered practically sterile. It is commercial sterilization or the processing of foods and containers to the extent of killing the majority of micro-organisms. This term is distinct from absolute sterilization.

Prairie Hay—See Feeds and Feeding.

Prato, Queijo Prato—Prattigau—See Cheese.

Pream—See Milk and Cream.

Pre-blending—See Cheese.

Predisposing Causes of Disease—These are causes of disease which act to bring about a condition or state of certain organs of the animal body in which there is a special susceptibility to disease.

Pregnancy, Determination of, in Animals—While there are various ways used by the layman, for accuracy it is best to call in a veterinarian.

Pregnant—Condition of being with young preparing to bring forth

Pre-ignition—Ignition taking place before the designated time in an internal-combustion engine that is before the spark occurs in a spark ignition engine

Premature Birth—Generally expulsion of the young before full term but late enough to permit independent survival
See Abortion

Premier Breeder Award—An award made to a breeder of animals winning the most prize money in the show ring, whether exhibited by himself or others. Credit is given in all single classes but not in group classes

Premier Jus—Same as Oleo

Pre-packaging—Preparing and Cleaning—
See Cheese

Prepartum Milking—The practice of milking cows before parturition or calving. Comprehensive experiments at the West Virginia Experiment Station included some 100 cows of three breeds: Ayrshire, Holstein and Jersey. The results indicated wide difference in the amount of prepartum milk. This work indicated that the practice of prepartum milking had no effect on the incidence of milk fever and did not reduce the amount of congestion nor the length of time for the udder to become normal following calving. The prepartum group seemed to have an increase in the number of retained placenta. Only a few of the cows, prepartum milked, produced any appreciable amount of additional milk.

Prepotency—The ability of an animal, whether male or female, to stamp its own characteristics on its offspring.

A marked capacity on the part of an individual strain or the like to transmit a character or characters to the offspring irrespective of the other members of a cross. Such characters are now regarded perhaps as mendelian dominants being fully prepotent only when homozygous.

Prepotent—Characterized by prepotency

Preservation of Milk Samples—See Milk Samples Preservation of

Preservative—A substance which may be added to foods in order to inhibit the growth of microorganisms and prevent the resulting spoilage of food.

Press Bag—**Press Plates**—**Press Vat**—**Pressed Cheese**—See Cheese

Presser Cheese—See Cheese Defects

Pressure—Force exerted by a homogeneous liquid or gas per unit of area at point where measurement is made. Absolute pressure is reckoned from a perfect vacuum i.e. zero pressure as a base. Gauge pressure is reckoned from atmospheric pressure as a base.

Pressure Lubrication—Engine lubrication system in which oil under pressure is forced to all main and crankpin bearings. Usually also includes supplying of oil under pressure to crankshaft and valve rocker arm bearings. In a full pressure system the connecting rods are also drilled and the piston pins lubricated under pressure.

Pressure Pack—See Cheese

Pressure Type Bottle Washer—A type of milk bottle washer in which the bottles to be washed are inverted in cases and passed over a series of tanks containing washing solution and rinse water. The water is forced through small jets into the bottles by means of powerful pumps.

Prestost Cheese—See Cheese

Presumptive Test—A standard method test for the presence of members of the coliform group in water supplies. The formation of 10% or more gas in a standard lactose broth fermentation tube within 24 hours at 37°C (98.6°F) is known as the presumptive test.

Price—In marketing the dollar value given or pledged as the amount to be given or received in exchange for produce or any other goods.

Price Plan for Milk—See Milk Classification Price Plan

Pricking Cheese—See Cheese

Primary Root—The first root produced on germination of a seed.

Prime Grade—See Beef Carcass

Primo Cheese—See Cheese

Print Butter—See Butter

Print Cheese—See Cheese

Process Butter—See Butter

Process Cheese—Process Cheese, Control Tests—See Cheese.

Process Cheese Defects, Gassiness—See Cheese Defects.

Process Cheese, Pasteurized—Process Cheese Salts—Process or Emulsified Cheese, Canada—See Cheese.

Processing—Relative to dairying the term is generally used to include the process of cooling, pasteurizing and bottling milk. Also refers to the process of making cheese, butter, condensed, evaporated and dried milk. However, regarding butter and cheese it is generally spoken of as butter-making and cheesemaking.

Processing Tax—A federal tax levied upon the processors of certain agricultural commodities.

Processing Test—See Dairy Tests.

Produce—To give birth to. That which is produced; also, agricultural products or produce.

Produce of Dam—A group classification of dairy cattle for the show ring. It consists of two animals of either sex and any age, out of the same cow.

Producer-Consumer Cooperative—A type of cooperative system where consumers and producers join together to process and distribute milk from farmer to consumer. The surplus money (after all expenses are paid) is shared among the farmers and consumers according to the extent each individual has a vested interest, or on the basis of patronage.

Producer-Retailer—In dairying, this term generally refers to a dairy farmer who produces, processes and sells his own milk to the public.

Producers' Bargaining Cooperatives—Cooperatives organized to represent producers in the sale of milk to handlers and, in some cases, to collect money from distributors and pay it to the farmers.

Producers' Operating Cooperative—Producer cooperatives are farm business organizations that primarily perform services for their members. These services include such things as: purchasing supplies and equipment, receiving, handling, processing and selling of its members' products and acting as a bargaining agent.

Production of Milk in the U. S.—Statistics from the U. S. Department of Agriculture show that in 1956 125.7 billion lb. of milk was produced. See Milk Statistics in Reference Section. Also Agriculture Statistical Yearbook, U.S.D.A. Washington, D. C. and International Institute of Agriculture, Rome Italy, for world statistics.

Production Per Man Hour—The number of units of production produced per man per hour.

Production Ration—The ration an animal consumes in addition to its maintenance ration in order to increase its body substance, or to serve for the production of muscular work, or to produce milk, wool, or beef, as the case may be. See Maintenance Ration.

Productive Enterprise—A business venture into farming for profit and experience which includes a group of related jobs in the production and marketing of a farm commodity covering a period of a complete production cycle.

Productive Soil—A soil in which the chemical, physical and biological conditions are favorable for the economic production of the crops suited to a particular area.

Proenzyme—See Zymogen.

Profile (soil)—A vertical section of the soil through all its layers (horizons) extending down into the parent material.

Progeny—Offspring of animals.

Progesterone—The hormone secreted by the corpus luteum; its action is to supplement that of estrone and has a marked effect on the growth of the alveolar system of the mammary tissue. It has the special functions of inhibiting ovulation, stimulating the growth of the uterus, and sensitizing the uterus for the implantation of the embryo. Also called lutin and corporin.

Project, Agriculture—An undertaking devised to effect the reclamation or improvement of a particular area of land; as by irrigation.

An Agricultural enterprise, usually of a specified scope, conducted by a person enrolled in vocational agriculture. Labor and management on the project is usually done by the pupil who also fully or partially owns the enterprise. It is supervised by the agricultural teacher. Parents

often render assistance and advice Ex-
amples of projects are one acre potatoes
two acres corn three acres small grain
farm records etc

Project Improvement—A term used in
vocational agriculture which means a proj-
ect intended to increase appreciably the
real estate value of the farm or to im-
prove the efficiency of the farm business
It usually does not produce an immediate
or direct income to the individual pupil
It should be distinguished from the "pro-
ductive enterprise project"

Project, Productive Enterprise—A term
used in vocational agriculture which
means a project that is intended to yield
a financial return to the person conduct-
ing it

Prolific—Producing young or fruit freely,
fruitful fecund

Proline— $C_4H_9NCO_2H$ —An amino acid
found in milk proteins Casein contains
about 11 gms per 100 gms and Blacto-
globulin about 4 gms per 100 gms

Promoter's Condensery—See Condensery
Promoters

Propagate—To cause to continue or mul-
tiply by generation or successive produc-
tion as to propagate a breed of cows or
a variety of corn To transmit to offspring

Propionibacterium (shermanii & freuden-
reichii)—Gram positive non-spore form-
ing rod-shaped anaerobic organisms
which act upon the milk sugar to form
propionic acid acetic acid and CO_2 These
bacteria are used in the culture for Swiss
Cheese (Emmentaler) Their action hastens
the development of "eyes" and also helps
to produce the characteristic mild nut-
like flavor in the cheese See Eye Forma-
tion in Swiss Cheese and Swiss Cheese,
Emmentaler

Propionic Acid—An acid closely related to
the flavor of certain cheese which in
combination with gases causes the char-
acteristic holes in Swiss cheese

It is also used to prevent mold growth
on cheese

Propionic Acid Bacteria—A group of bac-
teria to which the genera name propioni-
bacterium has been given are known to
produce propionic acid rather than lactic
acid by fermentation of carbohydrates
This is the characteristic fermentation
in Swiss cheese

Proportion—The relationship of one 1
or share to the whole or to another p

Proprietary Condensery—See Condens-
Proprietary

Proprietary Feeds—Ready mixed f
made up according to a company-
controlled secret formula and sold i
a guaranteed chemical analysis

Proso Millet—See Feeds and Feeding

Protamone—See Iodinated Casein

Protandry—In hermaphrodite animals
developments of male organs or ripenin
their product some time before thos
the female sex which prevents fertiliz-
of the eggs by spermatozoa of the
parent In insects the appearance
males earlier in the season than fe-
of the same species

Protease—An enzyme which hydrolyz
breaks down protein material into
tones amino acids and ammonia
a normal constituent of milk It was
reported by Babcock and Russel in
and named galactase Milk contain
protease which is precipitated with c
and which exhibits optimal activit
pH 9.2 It is inactivated by heat a
80°C. (167 176°F) and in acid soluti
destroyed at 72°C (161.6°F) in 10
utes

Protective Colloid—A colloidal sub-
stance such as gelatin albumin or sodium c
which stabilizes or protects other
stances (proteins fats salts etc.)
separating out of colloidal dispe-
Suspensions may be stabilized or
ected by the presence of emulsoids c
loidal substances which become ab-
on the suspended particles thus pr-
ing aggregation and precipitation c
suspension See Gold Number

Protective Milk—Research work a
University of Minnesota indicates th
injecting vaccines for disease pro-
viruses and bacteria into the udd-
cows the cows will manufacture
quantities of antibodies in the milk
thereby that by vaccinating cows
will produce protective milk hence
farmers could by use of a stip-
amount of such milk accomplish
same result as is now accomplish
vaccinating the consumers This i
in the experimental stage but see
have possibilities

Protein—A nitrogenous organic constituent of food manufactured in plant or animal tissue. A naturally occurring polymer of certain alpha amino acids.

Individual proteins differ in the proportions and sequence of amino acids, in the length of the polymer chains and in the specific orientation and organization of such chains in the molecule. Some proteins contain substances other than amino acids. Twenty different amino acids occur commonly in proteins.

See Feeding the Dairy Herd in the Handbook Section, P. 1.

Protein, Available—Those proteins in foods and feeds which are digestible by animal bodies

Protein, Crude—The sum total of nitrogenous materials in foods and feeds.—See Crude Protein.

Protein Degradation—Breakdown of protein usually by hydrolysis of peptide bonds.

Protein, Digestible (Available)—That part of the crude protein in a feed which the animal can digest, usually 75 to 85%. (The specific amount is determined by feeding experiments). Crude protein is that part of the feed which contains nitrogen, a very important element in feeds. The amount of nitrogen is determined by chemical analysis, and multiplied by 6.25, because only about 16% of protein is nitrogen. The result is the amount of crude protein in the feed analyzed.

Protein Equivalents—See Feeding the Dairy Herd in Handbook Section, P. 1.

Protein Equivalents in Dairy Foods
 ½ cup cottage cheese } give about the
 ¼ glasses milk } same amount
 3 ounces Cheddar cheese } of protein

Protein Milk—See Milk.

Protein Stability—The ability of protein molecules to withstand aggregation by dehydration or by a change in the electric charge on the protein molecule.

Proteinases—See Proteases.

Proteolysis—The cleavage, hydrolysis, or breaking down of proteins into water soluble compounds by rupture of their peptide bonds; forming proteoses.

Proteolytic Flavors—Develop as a result of the gradual breaking down of protein

and amino acids in the casein residue left in the butter. These flavors are of the cheesy roquefort type. Thorough pasteurization, good washing of butter and careful observance of the best sanitary practices will limit the number of these undesirable germs (the causative factor) and thus reduce to the minimum the proteolytic action.

Proteose—A soluble protein sometimes found in milk after coagulation of lactalbumin and lactoglobulin. It is not known whether it is a normal constituent of milk as drawn from the cow, or whether it is derived from the other proteins during coagulation.

Proteose-Peptide Fraction—A fraction of the serum proteins of milk which is not rendered acid precipitable by heat treatment of the milk. The name "proteose-peptide" was applied because this fraction behaves somewhat like proteoses and peptones which are partial hydrolysis products of proteins.

This fraction comprises 20-25% of the serum proteins or 0.12-0.15% of cows' milk.

Proteus—A genus of bacteria which are highly pleomorphic (having many forms), gram negative, motile rods which produce ameboid (like an amoeba, the simplest of animal form) colonies on moist media.

Protogyny—In hermaphrodite animals, development of female organs or products before those of the male sex; opposite of protandry.

Protoplasm—The only form of matter in which, or by which, the phenomena of life are manifested, and is hence often called the physical basis of life. Protoplasm exists in many different modifications; ordinarily it is a thick viscous semi-fluid or almost jellylike colorless, translucent material containing a large percentage of water, and holding fine granules in suspension. Chemical examination of protoplasm after the death of the cell shows protein substances; as long as the organism lives the protoplasm is the seat of more or less active chemical changes, both destructive and constructive.

Provatura—See Cheese.

Proved Sire—A bull that has demonstrated by his daughters his ability to transmit the dairy qualities desired.

A sire that has a certain number of daughters with known production records. The number of daughters required varies with different breeds but is usually four or more. The bull may be proven good or bad.

Provender—See Feeds and Feeding

Providence Cheese—Provole—See Cheese

Pseudoglobulin—A protein which precipitates as a globulin at 50% saturation with ammonium sulfate but which remains in solution when dialyzed free of salts. Milk contains a pseudoglobulin in the amount of about 0.5 gms per liter.

Pseudo-Lactica—Another group name for the colon aerogenes organisms.

Pseudomonas—A genus of bacteria characterized by gram negative rods and which produce a green blue or yellowish green water-soluble pigment.

Psychrometer—In cheesemaking a pair of wet and dry bulb thermometers to measure the humidity of the air in the cheese curing room.

Psychrophilic—Cold loving. This term is usually applied to bacteria that grow best at relatively low temperatures 4°C. to 10°C. (39°F. to 50°F.). Some of these organisms may cause the decay of foods in cold storage. See Obligate Psychrophils.

Ptomaine—Former name for food poisoning by contaminated food. Ptomaine comes from the word ptoma meaning corpse. Hence products formed from decomposing nitrogenous matter were named ptomaines. First found by Italian toxicologist Selmi in 1870.

Ptomaine Poisoning—See Food Poisoning and Handbook Section P 91.

Ptyalin—A starch-splitting enzyme acting in a medium of pH 6.0. It is a common enzyme found in the saliva of mouths of mammals.

Puberty—The period in life at which the generative organs first become capable of exercising the reproductive function characterized by heat and ovulation in the female and semen production in the male.

Publow Acid Test—See Dairy Test.

Pudding—The destruction of soil structure by cultivation when the soil is ex-

cessively wet. Most serious with heavy clay, clay loam and silt loam soils.

Pudic Blood Vessels—Blood vessels arterial and venous leading to and from the udders of cows. Blood enters the udder through the pudic arteries which lie in the ventral (inside) side of the thigh bones, one artery flowing to each half of the udder. The pudic veins parallel the pudic arteries. These veins are one of three routes by which the blood leaves the udder.

Puerperal Fever—See Diseases in Cattle.

Pull Up Of Cheese—Pultost Cheese—See Cheese.

Pumice—A kind of volcanic glass that is so full of minute cavities that it is very light. Hardened volcanic glass froth. Its color is white, gray, yellowish or brownish, rarely red. It is much used in the form of powder for smoothing and polishing, also called pumice stone.

Pump—A device or machine that raises, transfers or compresses fluids or that attenuates gases especially by suction or pressure or both. There are many kinds of pumps as displacement, piston, centrifugal, rotary, jet, etc.

Pumpkins—See Feeds and Feeding.

Punching Skewering—See Cheese.

Punctiform—Having the form of a point. See Pin point colonies.

Purebred—Any animal that traces back through all its lines to the foundation stock of the breed. It represents a pure bred. Purebred cattle as understood in America are those whose ancestors came from the native home of the breed in question and conform to the requirements of the breed here.

Pure Culture—The growth of a single species or strain of an organism without contact or association with other living species or strain.

Pure-line Theory—In biology the theory that from the repeated inbreeding of like homozygous individuals there will result a genetically uniform line of descent which when inbred will perpetuate itself with out genetic change. Practically this result is hindered by the occurrence of mutations. All variation in pure lines other than that due to occasional mutations is

a consequence of environmental variation; consequently, selection is ineffective in producing change.

Purification of Bacterial Cultures—The means whereby one culture is separated from another so that its characteristics may be studied.

Purpurogallin Test—See Dairy Tests.

Purulent—Inflammation, generally resulting in a certain amount of pus developing.

Pus—A fluid, thick and yellow, resulting from inflammation containing pus corpuscles liquified by proteolytic bacteria.

Pustulant—A term applied to a drug that is used to produce a very high degree of irritation of the skin. It is used as a counter-irritant. This term is not in common usage now.

Putrefaction—The decomposition of dead vegetable or animal matter by the action of microorganisms. It manifests itself as semi-liquid products, many of which have disagreeable odors. On account of the general presence of lactic acid in dairy products, putrefaction rarely occurs with the possible exception of putrid butter and some types of Limburger cheese with a high water content. See Book on Bacteriology.

Putrefaction Period of Milk—The fourth and last period in the normal fermentation of milk. During this period certain

putrefactive types of bacteria, which were dormant during the period of high acidity of the milk, begin active growth. Together with yeasts and molds, they attack the solid constituents of the milk, breaking them down to a clear liquid with no resemblance to milk. This is the final decomposition point. See: 1. Germicidal Period; 2. Souring Period; 3. Neutralization Period.

Putrid Flavor—See Dried and Evaporated Milk Defects.

Putty—A kind of cement usually of whitening and boiled linseed oil, beaten or kneaded to the consistency of dough, and used for fastening glass in sashes, stopping crevices, and for similar purposes.

Pycnometer—An instrument used in determining specific gravity. It is a special bottle which may be weighed full of a liquid at a given temperature.

Pyometritis—See Diseases in Cattle.

Pyrethrum Sprays—These are oil-base sprays and are fast killers. They can be used effectively to supplement others. Caution must be used if they are sprayed on animals; these insecticides are poison. Manger and water cups should be covered, all feed protected from the spray whenever it is being used.

Pyridine—A nitrogenous base which is the nucleus of many organic compounds, for example, nicotine.

Pyridoxine—See Vitamins.

Q

Q-Fever—A rather rare mild fever somewhat like typhus. Caused by a little known organism, apparently of the virus size. Outbreaks have occurred in Australia and in the British Isles. In some instances it seems to have been traced to cow's milk. This organism seems to be quite heat resistant, but indications are that it can be destroyed by high temperature pasteurization.

Quacheq Cheese—See Cheese.

Quack Grass—See Feeds and Feeding.

Quadruped—An animal having four feet, as most mammals.

Quality—In animal husbandry, this term refers to the relative fineness of structure of an animal. It is indicated by fine hair, loose and pliable skin, an even covering of firm, mellow flesh, fine but strong bone, a clean-cut head which is free from coarseness, a stylish appearance; in general, refinement throughout.

Quality in dairy products refers to excellence of make and is always associated with high standard of product

Quality Milk Production—See "Requirements for Sanitary Production of Milk and Sweet Cream For Manufacturing" in the Handbook Section P 60

Quarantine—A restraint or restriction of persons by the proper authorities to prevent spread of disease also placed upon the transportation of animals plants or goods suspected of being carriers of disease or other pests

"Quarg"—See Cheese

Quarter—In dairy cattle one of the four sections of a normal cow's udder

Quarter Fat Cheese—See Cheese

Quart Points—The standard unit of measure in figuring delivery costs for dairy products. Sometimes used as a basis for payment of drivers' commissions. The following are considered as quart points: 1 qt or 2 pts of milk, $\frac{1}{2}$ pt cream, 1 qt. of buttermilk and 1 lb of butter

Quaternary Ammonium Compounds—The term "quaternary ammonium" represents one of four possible classes of organic nitrogen compounds that may be derived from ammonia. In general the quaternary ammonium compounds marketed today are surface active agents which have good germicidal properties, good wetting action but relatively poor detergent action.

Several compounds of this type are available on the market, but their advantages and limitations are not yet well established. At the present time, investigational work indicates some probable special advantages such as (1) a less objectionable odor (2) less severe corrosive action (3) less loss of efficiency in the presence of small quantities of organic matter (4) greater stability when used at temperatures of 120°-150°F and (5) greater efficiency in the presence of alkali cleaning agents. The addition of a chemical sanitizing agent to the wash water containing a cleaning agent appeals to the uninformed person who would like to wash and sanitize in one operation. However, this would not work out well as the purpose of using a sanitizing agent demands that it be used *after* the equip-

ment is cleaned and rinsed. Therefore an attempt to combine the two operations is as erroneous as an attempt to dry the equipment while spraying it with rinse water.

Quaternary Ammonium Solutions, Strength of—See Laboratory Manual (Milk Industry Foundation)

Quattrolo—See Cheese

Quebec Jersey—See Canadian Jersey Same as French Canadians

Queso Anejo—Queso Blanco—Queso de Bola—Queso de Cavallo—Queso de Cincho—Queso de Crema—Queso Fresco—Queso de Hoja—Queso de Mano—Queso de Palma Metida—Queso del País—Queso de Prensa—Queso de Puna—Queso de la Tierra—See Cheese

Quevenne Lactometer—An instrument used in the determination of the specific gravity and solids content of milk. The Quevenne lactometer is floated in milk and resembles a large air chamber with a bulb of shot or mercury at the bottom. A scale in lactometer degrees reading from 15 at the top down to 40 at the bottom is attached as is also a thermometer. Because of lack of space on glass stem 1.0 is omitted thus to get full lactometer reading 1.0 is added to reading on stem. Hence if reading on stem is 30 the completed reading would be 1.30.

The actual reading indicated on this lactometer is correct only when the milk is at 60°F. If the milk is between 50°-70°F a correction factor is used to give the corrected reading. This reading is .1 of a lactometer degree and is added to the lactometer reading for each degree the temperature is above 60°F and subtracted for each degree that the milk is below 60°F. The lactometer is a useful instrument but care must be taken in its use or some inaccuracies may show up if one attempts to ascertain exact percentage of adulterations.

Quicklime—Unslacked lime

Quick Test for Moisture—Quinhydrone Electrode for the pH of Cheese—See Dairy Tests

Quirt—A riding whip with a short handle and a lash of braided rawhide

R

Rabacal Cheese—See Cheese.

Raceme—A flower cluster (inflorescence) in which flowers are borne on short stalks along an elongated axis.

Rachilla—The axis of the spikelet to which the glumes, lemma and palea are attached.

Rack—A frame work in which fodder is placed for cattle, horses, or sheep: usually made with upright partitions so placed as to leave room only for one animal's head between them.

A framework fitted to a wagon or truck for carrying hay, straw, or grain, livestock, or other bulky loads; also, a wagon or truck having such a frame.

A certain gait of a horse or other quadruped; a pace.

In meat packing, the foresaddle of any carcass.

Rack Saw—A saw having wide teeth.

Radener Cheese—See Cheese.

Radiant Heat—The heat which is given off from hot bodies in all directions, in direct paths, and to an infinite distance.

Radiation—Radiation is the passage of energy through space without the necessary presence of matter.

Radio Frequency Heating—See Pasteurization Substitutes.

Radolfzeller Cream—See Cheese.

Rag Doll (in testing)—A device used by farmers for testing the germination of seeds, especially corn, consisting of a strip of cloth, with numbered squares, on each of which several seeds or kernels are placed, the whole being rolled into a bundle and kept moist during the test.

Practice more or less obsolete. Farmer's testing of seed has generally been replaced by commercial operations.

Ragnet Cheese—See Cheese.

Rail Fence—A zigzag fence of rails crossing at their ends. Also railed snake fence and worm fence.

Rake—An implement usually consisting of a bar with projecting teeth or prongs, set transversely at the end of a long handle,

and used for gathering hay or stubble, stirring and spreading earth, etc.; also a machine for gathering hay, as the dump rake, side delivery rake, etc.

Ram—A hydraulic ram; a force pump. An uncastrated male sheep.

Ramal Supernumeraries—Supernumerary teats branching off the normal teats.

Rancid Flavor—See Butter Defects and Dried and Evaporated Milk Defects.

Rancidity—The state or quality of being rancid. Having the peculiar taint of spoiled oily substances.

A flavor defect of dairy products resulting from the hydrolysis of butterfat with the subsequent liberation of fatty acids of low carbon content, particularly butyric acid. In milk, rancidity often accompanies udder disturbances and frequently appears in milk from cows well along in lactation. Dairy products which have been held in storage often have this defect as a result of the action of the enzyme lipase, or of acids, or iron and copper salts which act as catalysts.

This rancidity is not always a defect as lipolytic enzymes or rennet paste are added to milk in the making of certain types of Italian cheese to promote rancidity.

This defect is found in all dairy products.

See Butter Defects and Milk and Cream Defects.

Range (in Agriculture)—A term generally applied to the open grasslands of the plains region of North America, where cattle, sheep and horses feed.

Range-bred—Bred and reared on the range; accustomed to living in the open country as range-grown cattle and horses.

Range Grass—See Feeds and Feeding.

Range Rider—A cowboy; one who herds cattle on the range.

Rangipori Cheese—See Cheese.

Rape—Rape Seed Oil Meal—See Feeds and Feeding.

Raper Cheese—See Cheese.

Rapid Acid Test—See Dairy Tests.

Rassalzüge Milk—See Milk and Cream Defects

Rat Tail—A tail of an animal with but little hair Similar to the tail of a rat.

Ratio of Concentration—See Milk Processing and Processing Equipment

Ration—The amount of food supplied to an animal for a definite period usually for a day The feed allowed for a given animal daily whether it is fed at one time or in portions at different times

Ration and Vitamin Emulsion—Liquid vitamin starter for very young animals

Ravignola—See Cheese

Raw Milk—See Milk

Raw Milk, Detection of in Pasteurized Milk—See Phosphatase Test

Rawhide—Untanned cattle skin

Rayon Cheese—See Cheese

Reaction—Chemical action between two or more substances

The degree of hydrogen ion or hydroxyl ion concentration viz basic reaction or acid reaction

Reactor—An animal which gives a positive reaction to the tuberculin test there by showing evidence of tuberculosis An animal giving a positive reaction will show a local swelling at the point of inoculation when the tuberculin is injected intradermally a thermal reaction takes place when the tuberculin is injected subcutaneously lachrymation and conjunctivitis take place when the ophthalmic (eye) method is used Also an animal giving a positive agglutination test to brucella

Reader for Babcock Tests—A colored liquid not miscible with fat which is used in the Babcock test readings for milk and cream The liquid is added carefully so that it rests upon the fat column flattening the surface of the meniscus and thus facilitating the reading of fat percentages Amyl alcohol and glymol colored red with alkanet root obtainable from a drug gist are most commonly used An ounce of the root in a cheesecloth bag placed in a quart of glymol colors it red in one or two days Also called Red Reader

Rear—To breed and bring to maturity as in livestock production

Reaumur Thermometer, R—See Thermometers

Rebbiola Cheese—Reblochon Cheese—See Cheese

Receiver—In mechanical refrigerating systems a tank in which the liquid refrigerant is held in storage after coming from the condenser and before passing to the expansion valve

Receiving and Shipping Station—A centrally located point where milk from producers is received weighed and cooled prior to shipping into the city Receiving stations are generally located in the center of dairy farming districts and rarely cover an area larger than 5 miles in radius. Proper shipping facilities and a good water supply are essential for a successful receiving station These stations may be anything from a small platform to a well-constructed shed and should be covered if possible to protect the milk from the sun

Receiving Room—In a milk plant the room devoted to the inspecting weighing and sampling of milk as it comes from the producer

Receiving Vat—A tank used for receiving milk (in a dairy plant) as it flows or is pumped from the weigh can or dump tank. From the receiving vat the milk is usually pumped to storage tanks although in small plants the receiving vat is sometimes used for storage

Recessive—See Recessive Character

Recessive Character—A term used in genetics describing the factor or characteristic received in the genes of one parent which is unable to manifest itself in the fully developed offspring because of the presence of a dominant allele or gene received from the other parent Ex.—In cattle the horned factor is recessive to the one for polled condition See Reversion or Atavism

Recknagel's Phenomenon—A rise in the specific gravity of milk which is held at low temperature after milking This rise persists even after the entrapped air is dissipated and may continue for 6 hours at 5°C (41°F) or 48 hrs at 15°C (59°F) The magnitude of the increase is of the order of 0.0010 to 0.0015 It is due to solidification of the milk fat

Reconstructed Cream—See Milk and Cream.

Reconstituted Milk—See Milk.

Recontamination Problem—See Ice Cream.

Recording Thermometer—See Thermometer, Recording.

Records—See Milk Production.

Red Book—The Herd Improvement Register Year Book of the Holstein-Friesian Association of America, which contains the individual records of each cow in the herd as well as the average for the entire herd computed to the mature equivalent. Records of production of daughters of sires are grouped under their respective sires.

Red Clover Seed Screenings—See Feeds and Feeding.

Red Discoloration—See Cheese Defects (Color-Cheddar).

Red Lead—A mineral often used as a paint pigment to protect metals from corrosion.

Red Milk—See Milk and Cream Defects.

Red Polled Cattle—A breed of cattle originating in Norfolk and Suffolk, England and imported into this country during colonial days. At that time, however, the breed was not kept pure and the first importation of the improved type was made in 1873. It is one of the most typical and most popular of the dual-purpose breeds. The animals are usually a deep cherry red in color although a few white markings are allowed. Cows usually weigh between 1200 and 1300 lb. while bulls average about 2000 lb. The animals are characteristically polled (without horns). They are usually superior to Shorthorns in milk production but inferior to them in beef production. Their milk averages about 4% fat.

Red Reader—See Reader.

Red Shorts—See Feeds and Feeding.

Red Spots—See Cheese Defects (Limburger).

Red Star—An international organization for the succor of animals. It originated in Switzerland and has engaged in campaigning against the neglect, abuse, and cruelty to livestock, and against bullfighting, cruel methods of trapping, etc.

Red Top—See Feeds and Feeding.

Redress—See Cheese.

Reductase—An enzyme found in milk which has reducing properties. Because of its presence in fresh milk, the latter can reduce sulfur to hydrogen sulfide and decolorize pigments, such as indigo, litmus, methylene-blue, etc. The reducing property is lost when milk is heated above 165°F. Three kinds of reductases have been distinguished, namely:

1. Hydrogenase or dehydrogenase, which reduces sulfur to hydrogen sulfide.
2. Reductase, which reduces methylene blue.
3. Aldehyd catalase, which reduces methylene blue with formaldehyde.

Reductases are probably bacterial products, since sterile raw milk does not have any reducing powers.

Reductase Test—See Dairy Tests.

Reduction is any process which increases the proportion of hydrogen or base-forming elements or radicals in a compound.

A reaction involving the gain of electrons.

Reed Canary Grass—See Feeds and Feeding.

Reference Oil—A standardized vitamin D cod liver oil used in conducting routine assays of vitamin D milk. It is fed to animals as a control. The U. S. P. reference cod liver oil now in use contains 95 U. S. P. vitamin D units per gram; *one unit is contained in 10.52 mg.*

Refraction—The deflection or bending from a straight path which a ray of light, heat, sound, or the like undergoes in passing obliquely from one medium into another in which its velocity is different, as from air into water or from a denser to a rarer layer of air.

Refractive Index—The number which expresses the ratio of the sine of the angle of incidence to the sine of the angle of refraction; a measure of the power of a solution to refract light; i.e., bend the beam of light passing through it. It varies with the media through which the light passes and is a function of the molecular concentration. Each particular substance in solution preserves its own refractivity, hence the index of refraction is that of the total of the refractive indices

of the substances in the mixture The refractive index of milk is usually in a milk serum and ranges from 1.3430 to 1.3445 Serum is obtained by separating the curd with any of the following reagents acetic acid CaCl_2 , CuSO_4 , rennet, or by natural souring

The refractive index of milk itself (not serum) is 1.3470 to 1.3510

Refractometer and kinds of—An instrument used for measuring the refractive index of a substance Especially useful in detecting adulterated milk There are several kinds of refractometers in general use The *Abbé refractometer* is used to determine the refractive index of fats fatty oils waxes and estimates the solids in sugar solutions The *immersion refractometer* is suited for the examination of milk serum to detect added water The *Pulfrich* is used with sodium light the liquid being held in a cylinder above the prism In the *Amagat and Jean* or *oleo-refractometer* an outer and an inner cylinder are respectively filled with an oil of known value or purity and with the oil to be examined The *butyro-refractometer* and the *Wollny type* are primarily used for milk fat they involve the same principle as the *Abbé*, but are simpler in construction and have arbitrary scales

Refrigerant—Any substance which produces cold through the absorption of surrounding heat Among the most important refrigerants are ice ammonia carbon dioxide methyl chloride and "Freon 12" Sulfur dioxide is also used to some extent

Refrigerants	Boiling point (atmospheric pressure)
Ammonia NH_3	- 28.0°F
Carbon Dioxide CO_2 (Dry Ice)	-108.4°F
Methyl Chloride, CH_3Cl	- 10.6°F
Freon 12 CCl_2F_2	- 21.7°F
Sulfur Dioxide SO_2	- 14.0°F

Refrigerants Commonly Used in the Ice Cream Industry—See Ice Cream

Refrigerate—To cool chill or to keep cold In dairy manufacturing refrigeration is an aid in preserving foods, and facilitating marketing of these foods

Refrigeration—

The removal of heat from a substance and therefore it is concerned with heat exchange (i.e., heat transfer) The excess

heat in the substance being cooled (refrigerated) is transferred to a cooler substance which becomes heated Therefore refrigeration is the reverse of heating both occurring simultaneously and being dependent upon the same principles and factors of heat exchange

In dairy practice refrigeration has three chief uses (1) prevents premature spoilage and preserves the rich natural flavors of dairy products (2) lengthens the time of storage of most dairy products thus enabling the owner to market his goods as needed (3) makes possible transportation of perishable goods

REFRIGERATION METHODS

Ice and Salt Method—Natural ice in very early times was harvested from ponds and stored to be used for refrigeration Since ice melts at 32°F., lower temperatures could be obtained only by mixing ice and salt This method is used now when a small amount of refrigeration is required

Mechanical Refrigeration—At the present time mechanical refrigeration is used almost entirely and has the advantages of less labor less cumbersome lower temperatures available more uniform temperature control more rapid cleaner and drier It is based on the principle that a liquid absorbs heat when it vaporizes as in the case of water changing into steam and the vapor can be collected, cooled to a liquid, and used again The particular liquid called "refrigerant," used in a mechanical refrigeration system depends upon many factors Some of the more important of these factors are: (1) the boiling point of the liquid (2) pressure characteristics (the pressures under which it can be used) (3) the latent heat of vaporization (amount of heat absorbed when the refrigerant vaporizes) (4) the ease with which a leak is detected (5) its corrosive action on metals used in the system and (6) its toxicity

The mechanical refrigeration system consists of only three essential parts

(1) The *compressor* consists of one or two cylinders, usually surrounded by a water jacket for cooling and containing pistons similar to those of a gasoline engine operated by a crank shaft that runs in oil in the crank case The compressor is usually belt-driven from a motor engine or other source of power The purpose of the compressor is to concentrate the vapor

It takes the vapor from the "low pressure side" of large volume at low pressure and low temperature, and discharges it into the "high pressure side." Thus the compressor occupies one of the two positions dividing the high and low sides. (2) The "high pressure side" extends from the compressor to the so-called "expansion valve" and includes the "condenser" and "receiver." The hot vapor leaving the compressor passes through the condenser, i.e., coils of pipe which are cooled by water or air. This cooling in the condenser changes the vapor into a liquid at about room temperature and still under a high pressure, the liquid being collected in a tank (the "receiver"). This liquid refrigerant passes on to the "expansion valve" which is the other position dividing the high and low sides. (3) the "low pressure side" extends from the expansion valve to the compressor. The expansion valve is usually an ordinary needle valve permitting fine adjustment and may be operated manually. It derives its name from the fact that the liquid refrigerant passes through the valve and then expands into a vapor. The liquid refrigerant is under high pressure at room temperature before passing through the valve and under low pressure at low temperature as it leaves the expansion valve to go through the "expansion coils," i.e., coils of pipes located where refrigeration is to be produced, and leading back to the compressor. In this way the refrigerant, is used repeatedly, being compressed, condensed and expanded. The refrigerant never wears out, but slight leaks invariably occur making it necessary to replenish the supply. The refrigeration or cooling is obtained by means of the expansion coils since in these coils the liquid refrigerant absorbs heat while vaporizing. The pressure in these expansion coils determines the low-est temperature obtainable, and this pressure is often called the "suction pressure" or "back pressure" of the system. The expansion coils may be located in the hardening room, in a tank of water or brine, in the ice cream freezer, etc., to give refrigeration in that particular place.

A large amount of heat is absorbed as the liquid changes to a vapor, and a smaller amount of heat is absorbed by the vapor when it expands further. This heat which is absorbed in the expansion coils is carried in the vapor to the compressor and on to the condenser where the heat is transferred from the hot re-

frigerant vapor to the cooling water or air around the condenser coils. Sometimes this cooling water is used only once and discharged, in other places it is more economical to re-use this water. In these cases the water is pumped to the top of a "cooling tower" and allowed to trickle down over the tower, being cooled by partial evaporation in the process. This proves more economical where the cost of water is high. In some Freon systems the condenser is air cooled, usually by a fan blowing air around the condenser coils that have fins to facilitate radiation of the heat. Although the principle involved in the mechanical refrigeration system is rather simple, the construction and installation is too complicated for a brief discussion. Usually it is more economical to obtain the services of a refrigeration engineer to supervise the planning and installation of the system.

Mechanical Refrigeration Cooling Methods—The *brine method* of cooling, sometimes called the "brine system," represents the first application of mechanical refrigeration. The expansion coils of the mechanical refrigeration system are immersed in a large tank of brine (a calcium chloride solution) to cool the brine. Then the brine is pumped through pipes to the freezer (or other place where refrigeration is desired) and back to the brine tank to be cooled again. This method involves additional investment in brine tank, brine solutions, pumps, pipes, etc. It is less efficient since the heat removed for refrigeration must be transferred to the brine and then to the mechanical refrigeration system. Other disadvantages are the corrosiveness of the brine, the difficulty in obtaining very low temperatures, and the more bulky installation. The most important advantages are that it permits storing up of refrigeration and can be used where ammonia leaks would be dangerous. Although it has been largely replaced in modern factories, it continues to find application in certain operations such as making ice cream novelties and in making artificial ice.

The care of brine systems is important and may be summarized as follows:

1. Test the brine every month for concentration, alkalinity and ammonia.
2. Keep the concentration of the brine high enough to give a freezing point at least 10 degrees lower than the lowest temperature to which it will be cooled.

Otherwise the brine will freeze onto the expansion coil and this ice will act as insulation preventing the heat in the brine from penetrating the expansion coil.

3 Adjust the alkalinity by adding a solution of sodium hydroxide (caustic soda) or of lime until the brine is neutral to litmus or phenolphthalein. If the brine is acid to litmus it is too corrosive.

4 Use only one metal preferably a pure grade of cast iron in contact with the brine. Two different metals favor corrosive action.

5 Immerse a bar or strip of zinc in the brine to decrease the corrosion when two different metals are used in the system.

6 Add a solution of sodium dichromate and caustic soda to reduce corrosion; however this will cause irritation of the skin. Care must therefore be used in handling the dichromate as well as the brine containing it. To make the solution thoroughly dissolve by stirring a mixture of 5 lb commercial dichromate 14 lb caustic soda in one gallon of water. This amount will be sufficient to treat 375 gallons of brine the first time. Once a year it will be necessary to add from one fourth to one half of the original amount.

7 Avoid air coming in contact with the brine since air makes the brine acid and more corrosive. Keep the brine tank covered and avoid bubbling air through the brine or spraying the brine.

8 Avoid ammonia leaks from the expansion coils which cause the brine to become more alkaline. They can be detected by boiling a sample of brine in a narrow necked flask and testing the vapors with red litmus paper. If the red litmus paper turns blue the steam from the boiling brine contains ammonia.

The "direct expansion" method of cooling has replaced the brine method in many installations since it represents increased efficiency and a saving in investment. In this method the brine pipes in the freezer (or other place where refrigeration is desired) are replaced by the expansion coils of the mechanical refrigeration system. These expansion coils may or may not contain much liquid refrigerant in addition to the refrigerant vapor

The "flooded system" or method of cooling is a special case of the direct expansion method in which the liquid refrigerant collects in the expansion coils

nearly filling the coils. The compressor draws off the vapor as the absorbed heat vaporizes the liquid. Thus in the operation of this flooded system the liquid refrigerant under high pressure and room temperature passes through a valve (usually controlled by a float) to the expansion coils where it is a liquid under a lower pressure and lower temperature. As heat is transferred to the liquid refrigerant evaporation takes place; the vapor from this evaporation is constantly removed by the compressor and the liquid level maintained by the float.

The important advantages of the flooded system are: (1) it is more efficient since heat is more readily transferred between liquids than between vapors; gas or liquid to gas; (2) less cooling surface or coil surface is needed; (3) there is less fluctuation in temperature. The fact that float valves occasionally stick causing liquid refrigerant to enter and damage the compressor is the main disadvantage.

Indirect System Refrigeration—An application of mechanical refrigeration to cold storage rooms. The expansion coils are located in a compartment outside the room to be cooled. Air is drawn over these coils by a fan cooled and then forced into the cold storage room through flues, the warm air being forced out of the room at the same time.

Refrigeration, Coolers for—

Pond type cooler system is used for large plants. The cooling ponds are of two types:

1 **Lakes**—artificial or natural. Hot water is discharged from condensers at one end of the pond and cold water is drawn from the other end for the condenser. Natural evaporation of water is used for cooling.

2 **Spray ponds**. Located at ground level or on the roof of a building. Water is sprayed into the air thus increasing the surface exposed for evaporation.

Cooling Tower (Forced-draft)—In this type of cooling tower, the rate of evaporation is increased by using fans that push or pull air through the tower. The common types are the wood filled and spray, both are enclosed and both may be placed either on the roof or located in a building. The wood filled tower provides a larger surface for water evaporation.

Unit coolers, used for cold-storage room refrigeration are either suspended

Rejected Milk—See Milk, Denatured.

Rejuvenated Cream—See Milk and Cream.

Relationship (Livestock)—In genetics: Kinship; consanguinity. Relationship may be direct, as when one individual is an ancestor of another, or collateral, as when two individuals trace descent from one or more ancestors common to both of them.

Relationship Coefficient—An estimate of the likelihood that two individuals possess similar inheritance through descent from common ancestors. Any two individuals may possess similar genes through chance alone; if they are related, however, there is an increased probability that their genes will be similar, this probability being stated as the relationship coefficient.

Relative Humidity—See Humidity, Relative.

Relaxin—A hormone which is said to promote the relaxation of the pelvic ligaments as a preparation for parturition.

Relief Milk—Milk sold during a depression at a reduced rate to families who cannot afford to buy fluid milk at a price that would be profitable to farmers and distributors. A program specifying how this milk is to be purchased and paid for and distributed to needy families is usually arranged by government, city or other welfare agencies, dealing directly with the milk producers and distributors.

Render—To melt down; to extract or clarify by melting; ex. to render lard—a rendering plant to extract fat from dead animals.

Rennet—An extract containing the enzyme rennin, or dried preparations of rennin. Commercial rennet is sold in clarified saline solution or in powdered form. It is probable that it usually contains a certain amount of pepsin. It is widely used in curdling milk for preparation of cheese and casein. See Pepsin, Rennin.

Butterwort (*Pinguicula vulgaris*), Lady's Bedstraw (*Galium verum*) and the seeds of *Withania coagulans* have been used as sources of vegetable rennets.

Rennet Coagulation—The coagulation of milk by the use of rennet extract which contains the enzyme rennin. The coagulation is more a gel than a precipitation.

There are two stages in the process of coagulation: 1. The formation of paracasein from casein. 2. The physical precipitation of the paracasein.

Rennet Curd—Curd formed by the action of rennet upon milk.

Rennet Extract—An extract of the stomach of calves or kids (young goats) which contains the enzyme rennin.

Rennet Paste—The finely comminuted fourth stomachs may also be formed into a paste which has rennet activity and it also contains lipase enzymes. This paste has traditionally been used to make Italian cheese. Now it has been somewhat replaced by purified rennet and lipolytic enzyme extracts.

Rennet Preparation—The fourth stomachs of the milked calves or goats are washed, dried, cut into small pieces and dissolved in a salt brine which may contain some boric acid or sodium benzoate as a preservative.

Rennet Test—See Dairy Tests.

Rennet Unit—The amount of enzyme which completely coagulates 2 cc. of milk containing 1% phenol, at 35°C. (95.0°F.) in 24 hours.

Rennin—An enzyme secreted by the gastric glands of suckling mammals although it is also found in leaves, fruits and seeds of various plants. The extract containing rennin is called rennet and its usual source is the inner lining of the fourth stomach of young calves, lambs, and goats. Rennin is one of the most powerful catalysts known and is widely used in coagulating the casein of milk in cheese manufacture. In the nourishment of young calves that are fed milk, rennin, by clotting the milk, retains it in the digestive tract where it can be acted upon by the digestive enzymes. This enzyme has only a weak proteolytic power at the pH of milk.

Rennin Coagulation—Theories—1. Rennin causes proteolysis of casein into paracasein. 2. Rennin causes association or polymerization of casein molecules into a causes proteolysis of casein into paracasein removes protective colloids from the surface of the casein permitting precipitation by CaCl_2 . 4. Rennin opens secondary valence unions between COOH and NH_2 within the casein molecule. 5. Rennin re-

leases soluble calcium from insoluble calcium phosphate

Rennin Stability—Rennin is destroyed above pH 6.9, is deactivated by shaking, is sensitive to light and heat is destroyed by peptic digestion in the presence of pepsin at low pH

Renovation (pasture)—The reinstatement of old run-down pasture areas to productivity. Renovation generally includes destruction of the present vegetation cultivation (disking) liming fertilizing and reseedling to desirable grasses and legumes

Reproduction Record—A record of offspring. It usually includes a record of when and to what sire a cow is bred, her due date date she freshens sex of offspring and other information

Reproductive Cycle—The outstanding characteristic about the reproductive process in the female is that it changes in a definite pattern called the sexual cycle. Most male farm animals are willing to mate at any time, but the female will mate only at certain brief intervals. The mating period called heat occurs in cattle throughout the year in a series of reproductive or estrous cycles that are repeated every 20 or 21 days

Requeijao—See Cheese

Requirement For the Sanitary Production of Sweet Cream and Milk for Manufacturing—See Handbook Section, P 60

Rerun Ice Cream—See Ice Cream—Rerun

Resale Price—The price at which distributors sell milk either wholesale or retail. In some states State Milk Boards set the resale price. In other states certain laws regulate the resale price of milk and in still other states distributors themselves set the resale price

Resazurin—($C_{12}H_7NO_4$) A dye sensitive to the changes which take place when the amount of dissolved oxygen in milk is decreased as the bacteria count or bacteria utilization of oxygen in the milk increases. The blue dye gradually changes from blue to lavender to pink to colorless as amount of oxygen decreases i.e. as bacterial growth increases

Resazurin Test—See Dairy Tests

Rescue Grass—See Feeds and Feeding

Resinates and Gums—Resinates and gums as constituents in washing powder, are also occasionally found in the powders and are usually added to protect copper fittings

Resistance—The ability of plants or animals to withstand adverse conditions such as disease, insect attack, winter cold sun scale or drouth

Respiration—The process by which an animal takes in oxygen and gives off the products formed by oxidation in the tissues, especially carbon dioxide. In plants, the process of gaseous diffusion and interchange between the intercellular spaces of plant tissue and the atmosphere

Respiration Calorimeter—Biochem. An apparatus for measuring the gaseous exchange between an animal and the surrounding atmosphere (particularly the oxygen consumed and carbon dioxide eliminated) and simultaneously the quantity of energy given out in the form of heat and work, to determine the relation of these factors to the food and drink consumed and to body activity

Respiratory Coefficient—Biochem. The amount of carbon dioxide given off, divided by the amount of oxygen used in respiration

Restandardizing and Calculating Some Unusual Mixes—See Ice Creams and Other Frozen Desserts by Frandsen and Nelson

Resting Area for Dairy Cattle—Suitable resting place for the dairy herd. This place should be dry, sheltered well bedded and protected from the wind. For details see Dairy Farm Structures in Handbook Section, P 210

Resting Phase—A term associated with the growth curve of microorganisms in any given medium. The phase begins with the cessation of active reproduction of cells and ends when cell population begins to decrease. It is the period of maximum cell population during which the cells appear to reach the highest state of maturity and revert to the size of resting cells. Also called Senescent Phase

Retained Afterbirth—See Diseases in Cattle

Reticulum—Also called honeycomb, and bonnet. The second stomach of the cow. Its interior is lined like a honeycomb

hence the popular name. It is connected with the rumen and the esophagus by means of the esophageal groove. In this sack, stones, nails, and other foreign objects may frequently be found. The contents are fluid and alkaline. There is no secretion from the walls of this stomach, and as a result it has no true digestive power.

Reversible Action—A chemical action which can be caused to proceed in either direction by suitable variation in the combinations of temperature, volume, pressure, or of the quantities of reacting substances.

Reversion—In genetics; the recurrence, in a descendant, of characters of a remote ancestor; the renewed manifestation of heredity after remaining latent during one or more generations. For example, the birth of red calves from purebred Holstein cattle. This phenomenon is now known to be due to each parent supplying a recessive gene which for several generations has been carried along hidden by dominant genes; i.e. whenever the dominant gene is lacking reversion occurs. Also known as Atavism. See Recessive Character.

Revert—Biologically, to return toward some ancestral type.

Revival Rate (Semen)—With frozen semen, generally used to indicate the percentage of the originally motile sperm which survive or "revive" after having been frozen.

Revolutions Per Minute (R.P.M.)—Unit for measuring rotative speed of a shaft, gear, pulley, wheel, separator bowl, etc.

Reworked Cheese—Reworked Cheese, Loaf—See Cheese.

Reworking Butter—See Butter.

Rheology—As related to dairy science, a study of flow and deformation properties of butter, cheese, and ice cream, a study of body and plasticity of these products.

Rheostat—An instrument for regulating the flow of electric currents. This affords a means of controlling the amount of current for example, as the resistance of the armature of an electric motor is usually quite small, some means must be provided for avoiding too great a rush of current at the start, when the motor is connected with a circuit, otherwise the armature may be overheated and ruined. It is therefore necessary to insert a certain

amount of extra resistance in series with the armature. A rheostat containing resistance coils is made up for this purpose and is called a starting rheostat.

Rhizobia—The bacteria capable of living in symbiotic relationship with leguminous plants in nodules on the roots, the association usually being capable of fixing nitrogen. (from the generic name *Rhizobium*).

Rhizome—An elongated, underground stem. Both leaf shoots and roots originate at the joints or nodes.

Rhodes Grass—Rhode Island Bent—See Feeds and Feeding.

Riboflavin—See Vitamins.

Riboflavin of Cheese—Cheddar Cheese—3 micrograms of riboflavin per gram of cheese. 25% of the riboflavin in the milk is retained in cheese.

Rice—Rice Bran—See Feeds and Feeding.

Rice Drier—A device consisting of temperature bins connecting with heated air, for drying and curing newly threshed rice on a large scale.

Rice Hulls—Rice Meal—See Feeds and Feeding.

Ricin—A white amorphous, very poisonous protein in the castor oil bean.

Rick—A stack or pile, as of grain, straw or hay, in the open air, usually covered with thatching to protect it from becoming wet.

Rickets—This is a dietary deficiency disease, characterized by a disturbance in calcium and phosphorus utilization, with the result that normal ossification or bone-formation does not take place. The bones become soft, muscles become weak and flabby, and although the disease is seldom fatal, pathological changes may develop to the point where health and strength are permanently jeopardized. Science has found that the disease can be prevented and cured by dietary treatment in which milk—rich in calcium and phosphorus—plus sunlight or additional vitamin D—play an important part.

When the disease occurs in adults, it is known as Osteomalacia.

Rickets (Cattle)—See Diseases in Cattle.

Ricotta Cheese—See Cheese.

Ridge—The top of the back of an animal, especially, the projecting part of the back along the line of the backbone of a quadruped

To throw soil toward a crop row from both sides, as to ridge corn

Riesengeburge Cheese—See Cheese

Rind—See Cheese

Rind Rot—See Cheese Defects (Finish & Appearance)

Rinderpest—See Diseases in Cattle

Rindless Cheese (natural)—**Rindless Cheddar**—**Rindless Swiss**—See Cheese

Rinds, Cracked—See Cheese Defects (Finish & Appearance)

Ring—A circular metal band attached to the nose of an animal as a bull to lead it, or a hog to keep it from rooting

An enclosure or space in which animals are shown in competition, for sale or the like, as the sales' ring at an auction, the judging ring at a show

Also the ridges or rings encircling the horns of cattle, increasing in number with age

Ringbone—**Ringworm**—See Diseases in Cattle

Rinnen Cheese—**Riula Cheese**—See Cheese

Rinse Method—A method for determining the sterility of dairy equipment and small containers such as milk bottles or cans. The bottles and cans are partly filled with sterile water and shaken vigorously to bring the water in contact with the entire surface. An agar plate count is then taken. Quart bottles that develop not over 1000 colonies are considered satisfactory, but properly sterilized containers will have fewer bacteria

Rinsing Vat—A vat continuously supplied with streams of fresh water for rinsing milk bottles

Ripened Cream Butter—See Butter

Ripening in Cheese—in Cheesemaking—of Cheddar Cheese—**Ripening the Milk for Cheesemaking**—See Cheese

Ripening Vat—See Butter

Ripper—An exceptionally good big animal

Roan—An animal having a bay, chestnut, red or brown color, with some white thickly interspersed

Robbiole—**Robbiolini**—**Rocamadour Cheese**—See Cheese

Rochdale Principles—In cooperative marketing the system whereby no credit is given, and all profits are distributed among customers, from Rochdale, England where the first English cooperative store of this type was established in 1844

Rock land—Areas containing frequent rock outcrops and shallow soils. Rock outcrops usually occupy 25 to 90% of the area

Rodent—Gnawing animals, including rats, mice, squirrels and rabbits all of which are characterized by sharp chisel-edged front teeth

Rodeo—A place where cattle are collected, especially a market place, in western United States, a roundup

Any spectacle like a roundup specifically, a public performance presenting the chief features of a roundup as lariat throwing, horse breaking etc

Rods—In Bacteriology. A descriptive term for rod shaped microorganisms

The hay bacillus group of bacteria (*Bacillus subtilis*) is an example of these rods

R of M—Abbreviation for Register of Merit. See Register of Merit

Roes-Gottlieb Method—See Dairy Tests

Rogue (Agronomy)—To remove from a field all poisonous, inferior or otherwise undesirable plants

Roll Cheese—See Cheese

"The Role of Milk in Improving the Nutritive Value of the Family Diet"—See Handbook, P 126

Roller (cheese)—See Cheese

Rolling (soil)—Having moderately steep complex slopes, intermediate between undulating and hilly

Rollot Cheese—**Romadour**—**Romanello**—**Romano**—**Romatour**—See Cheese

Roots—See Feeds and Feeding

Rootstock—A rhizome

Ropy Milk—See Milk and Cream Defects.

Roquefort Cheese—Composition of—Standards—See Cheese.

Roquefort Flavor—See Cheese Defects.

Roswell Pasteurizer—See Milk, Processing and Processing Equipment.

Rot Spots—Rind Defects—See Cheese Defects (Finish & Appearance).

Rotary Can Washer—An automatic can washer that washes, sterilizes and dries. The cans and lids are placed in the machine and remain there until dry.

Rotary Plow—A plow with rapidly revolving blades or hooked fingers. It is designed for the complete preparation of the seed bed in one operation.

Rotation Grazing—Small fields or paddocks are fenced off with the fields being grazed in a definite sequence. The grazing animals may remain 6 to 10 days in each paddock. This is really a less intensive version of the strip grazing technique.

Rotation (pastures)—The alternate grazing and resting of several pasture fields sown to the same crop. Also, alternate grazing of several fields sown to different crops.

Rotation of Crops—See Crop Rotation.

Rotolactor Milker—This equipment was invented and arranged by the late Henry Jeffers of Plainsboro, N. J. It consists of a rotary moving platform with a capacity of some fifty cows. All the equipment necessary is installed on this platform so that cows can be washed, dried and milked during one operation. The equipment is so synchronized that all of these operations can be completed in thirteen minutes, the time that it took to complete all these operations and for one cow to get off the platform and another one on. When the author visited this farm 1300 cows were being milked 3 times a day.

Rototiller—An implement with a rotating, cutting or cultivating instrument, useful in seed bed preparation.

Rough Texture—See Dried and Evaporated Milk Defects.

Roughage—See Feeds and Feeding.

Roughage Feeding Area—A convenient feeding area for hay and silage and for

watering the herd. See article on Dairy Farm Structures in Handbook Section, P. 210.

Roundup—The process of gathering together cattle on the range and driving them in, as for branding, or for marketing.

Routine Count—A bacterial plate must be used in the general control of milk supplies and in the grading of milk, as differentiated from research count which is employed where accuracy under specific conditions is the principal consideration.

Routine Milk Analysis—The type of milk analysis intended for general control of the milk supply or for the grading of milk. The usual analyses may include such common tests as 1. Babcock test, 2. Lactometer test, 3. Sediment test, 4. Methylene blue or Resazurin test, 5. Acidity test, 6. Phosphatase test.

Row Crop—Crops usually planted in rows.

Rowen—See Feeds and Feeding.

Rowland Method—See Dairy Tests.

Royal Brabant—See Cheese.

R.P.M.—Revolutions per minute.

Rubber Seed Meal—See Feeds and Feeding.

Rubbery Texture—See Ice Cream and Cheese Defects.

Rubble-land—Areas with 90% or more of the surface covered by stones and boulders.

Rubefacient—A counter irritant which produces a congestion and redness of the skin. Among them are cantharides, mustard, iodine, capsicum and camphor.

Rum Butter—See Butter.

Rumen—The first of the 4 stomachs in a cow. Also called the paunch. Mastication in the cow is not completed at the time the food is taken into the body. The cow simply chews the material sufficiently to pass it through the esophagus into the rumen which acts like a reservoir. The rumen has a large capacity, having a breaking point at about 50 gals. It is divided into 4 sacs by constrictions in the wall produced by large muscular bands. The interior of the organ is lined with well-developed mucous membrane, covered with pointed papillae. Churning and fermentation take place in the rumen and when the cow desires to ruminate, the

bolus or cud is passed back to the mouth by the combined action of the rumen and reticulum for complete mastication.

Ruminants—Animals that ruminate or "chew the cud." A division of even-toed, hoofed mammals which have a complex stomach, i.e. a stomach divided into several distinct chambers. In true ruminants, such as cattle, goats, sheep, and others not domesticated, the stomach consists of 4 distinct parts. They are (1) the rumen or paunch, (2) the reticulum or honeycomb, (3) the omasum or manyplies, and (4) the abomasum or true stomach. The ruminants regurgitate their food or cud from the first stomach to the mouth to be remasticated when the animal is at rest. This process is known as "chewing the cud" or ruminating; hence, the term ruminants.

See Rumen, Reticulum, Omasum, and Abomasum for description and function of these divisions of the stomach.

Rumination (Chewing the Cud)—A process of rechewing food by ruminant animals. In this process, a mass of solid food mixed with liquid, (the bolus or cud) is forced by muscular contraction from the reticulum or 2nd stomach (honeycomb) and rumen or 1st stomach (paunch) into the esophagus, from which it is forced into the mouth. The liquid portion is quickly swallowed, and the solid part is thoroughly chewed, after which it is again swallowed, passing usually by the paunch and honeycomb directly into the third and fourth stomachs (i.e. the omasum and abomasum) where digestion and absorption take place. This process takes place when the animal is at rest.

Run (Live Stock Term)—Meaning to drive cattle, sheep, etc., to or on a grazing place; as, to run cattle on the range; also to graze or feed over; as, the sheep in summer run the ranges.

The number of animals born in one season; as, the run of lambs.

Runesten—See Cheese.

Running the Whey—See Cheese.

Run Off—Water which does not soak into the earth when it falls, but runs off the surface of the soil.

Runt—Any small domestic animal as compared with the rest of its kind. **Runt**—Stunted in growth.

Runway—An exercise lot or passageway for animals.

Rural—Concerned with land; the country, as distinguished from urban, city or town.

Rural Electrification Administration (REA)—A government agency, established to supervise an electrification program in rural areas.

Ruralist—One who resides in the country; a farmer. In its widest sense, one who is interested in the various phases of country life.

Rush Mats (Reed Mats)—See Cheese.

Russian Thistle—See Feeds and Feeding.

Rust—Botanically, any of numerous minute fungi (parasitic) causing spots or discoloration of the tissues in higher plants; also, the disease caused by such fungi.

Chem.—The reddish coating formed on iron when it is exposed to moisture in the air. Corrosion of iron. Iron rust consists mostly of ferric oxide (Fe_2O_3) in hydrated form with minor quantities of related compounds.

Rust color—reddish red—yellow, a hue that is yellower than burnt sienna.

Rutabagas—Rye—Rye Bran—Rye Grass—See Feeds and Feeding.

S

Saanen—A breed of milk goats developed in the Saanen valley in Switzerland. They are considered very good milkers.

Saanen Cheese—See Cheese.

Saccharin—An "artificial sweetener" ($\text{C}_6\text{H}_4\text{SO}_2$) derived from coal tar and about

550 times as sweet as sucrose. Federal food laws generally prohibit its use in food products. However, special permission is sometimes granted for its use in making so-called diabetic ice cream. Often used as a no caloric sweetening agent, subject to pure food restrictions.

"Safe" Milk—Milk that has been adequately pasteurized is sometimes called "safe" milk.

Safety Indicator Paper—A patented indicator blotting paper which, put in contact with milk, gives some indication of whether it is obtained from normal, healthy or diseased animals. A thin jet of freshly drawn milk from each teat is put on the respective color spot. The indicator will color up yellowish green when touched by milk from healthy animals, whereas if greenish blue tones of coloration appear, they indicate disturbances of secretion. This modified Brom Thymol test may be of some help, as is the strip cup, in detecting abnormal milk.

Safety Valve—A safety valve on a steam boiler, hot water system, hot water tanks, air tanks, pressure cookers and etc, which opens when the pressure rises above a predetermined point. This check prevents the build up of excessive pressure which could cause damage to equipment and might result in a dangerous explosion.

Sage—A halfshrubby mint with grayish green pungent, aromatic leaves, which are much used in flavoring cheese, meats, etc. See Cheese.

Sagebrush—See Feeds and Feeding.

Sagging Beam Method—A method for measuring the viscosity of ice cream. The ice cream is hardened in bottomless metal boxes placed upon metal plates. After the hardening period, the ice cream in a beamlike form is clamped lightly upon aluminum blocks grooved to receive it. The distance from the bottom of the center of the beam to the table is measured periodically so that the amount of sag that takes place can be determined.

Sagrain—See Feeds and Feeding.

Saint Benoit Cheese—**Saint Claude**—**Saint Marcellin**—**Saint Remy**—**St. Stephano**—**Salamana**—**Salame**—See Cheese.

Sales Outlets—See Ice Cream.

Saline-Alkali Soil—A soil with an abundance of calcium, magnesium and sodium. Soil with a pH higher than 7. A soil containing sufficient exchangeable sodium to interfere with the growth of most crop plants and containing appreciable quantities of soluble salts.

Salinometer—See Salometer.

Salmonella—A genus of bacteria characterized by gram negative, non spore forming rods, it is primarily an intestinal parasite, and the principal cause of food poisoning.

Saloin Cheese—See Cheese.

Salolase—A ferment found in normal cow's milk. Also generally found in the mammary glands of sheep, goats, swine and mares.

Salometer, Salinometer—A hydrometer especially calibrated to measure the percentage of salt in brines. Salometer degree is approximately equal to the per cent of salt multiplied by 4. See Hydrometer.

Salt Soda—See Sodium Carbonate.

Salt-1 Chemically, any of a class of compounds formed when the acid hydrogen of an acid is replaced by a metal of a base 2. In common usage, sodium chloride (NaCl) is used as a seasoner and food preservation agent. Salt, in the dairy industry, is used chiefly to improve the flavor of butter and cheese. Also to a limited extent acts as a preservative. 3. See Use of Salt in Ice Cream Making. See Sodium Chloride.

Salt, Amount Recommended for Livestock—See Feeds and Feeding.

Salt Balance of Milk—The balance between the activity of calcium and magnesium on the one hand and phosphate and citrate on the other. This balance is an important determinant of the stability of the caseinate particles of the milk.

Salt Bottom—Sections of relatively low-lying alkali ground.

Salt Poisoning—An affliction of hogs and perhaps other animals when they receive whey which contains over 1½% salt, such as press drippings of brine solution, or excessive amounts of salt or brine.

Salt Soluble (cheese)—See Cheese.

Salt Stabilizers—Certain buffer salts such as sodium citrate, di-sodium phosphate, sodium bicarbonate, etc., which render milk or cream more stable to heat. These salt stabilizers compensate the normal excess of calcium in milk by acid phosphate, citrate, or acid carbonate ions.

Salt Stones—**White Specks**—See Cheese Defects (Color-Cheddar).

Salt Test for Cheese—Volhard Method—
See Dairy Tests

Salt, Use in Ice Cream Making—See Ice Cream

Saltbush—See Feeds and Feeding

Salted Butter—See Butter

Salt Hay—Hay made from salt grass or grass growing on tidal marshes. It is much used in mulching.

Salting Out—Saltless Cheese—See Cheese

Salty Flavor—See Ice Cream Defects and Milk and Cream Defects

Salty Texture—See Butter Defects

Samna—See Butter

Sample Bottle—A bottle used in the collection and holding of samples of milk or other fluids prior to chemical or bacteriological analysis.

Sampling Cheese—A.O.A.S. Method—See Sampling Method—See Cheese

Sampling Valves—See Milk Processing and Processing Equipment

Samsøe Cheese—See Cheese

Sanatogen—A grayish white tasteless powder containing 90% casein and 5% sodium glycerophosphate. When treated with cold water it swells forming on heating a milk like emulsion.

Sand Crack—In animals a vertical crack in the middle of the hoof.

Sanders and Sager Phosphatase Methods—See Dairy Tests

Sandiness—See Ice Cream Defects

Sandwich Nut Cheese—Sandy Process Cheese—See Cheese

Sandy Texture—See Dried and Evaporated Milk Defects

(3-4) **Sanitary Standards Committee—**A committee consisting of representatives from the International Association of Milk & Food Sanitarians from the Sanitary Standard Sub-committee of the Dairy Industry Committee and representatives from the U.S. Public Health Service who formulate sanitary standards pertaining to the construction of dairy processing equipment.

Sanitation—The science of sanitary conditions and use of sanitary measures, rendering sanitary. The removal of all materials capable of harboring disease or insect pests. In general following good housekeeping rules.

Sanitation to Prevent Fly Breeding—See Handbook, P. 253

Sanitization—The use of methods and material to preserve or restore hygienic or healthful quality. In other words, to assure a sanitary product sanitization must be maintained with hygienic equipment by hygienic employees in hygienic surroundings.

Sanitizing—Making sanitary. Sanitizing kills all pathogenic organisms but may leave a few bacteria (so-called reasonably small number or insignificant number). It is less expensive, less exacting and less time consuming than sterilizing although the same two groups of agents are used. For example Heat (as hot water) of 170°F for ten minutes will sanitize while heat (as steam under 15 lb pressure) of 240°F for 15 minutes will sterilize. See Handbook Section, P. 185.

Sanitizing Agents—The recommended sanitizing agents together with their advantages and the precautions to be observed in using them may be outlined as follows:

1 Heat is the most reliable agent especially when both temperature and time are carefully controlled. Its main advantages are its penetrating ability and the fact that it facilitates drying of the equipment.

- a Dry heat at 240°F for 5 minutes sanitizes.
- b Steam under pressure (15 lbs or 250°F) for 5 minutes sanitizes.
- c Steam at zero pressure (212°F) for 10 minutes sanitizes.
- d Hot (so-called boiling) water (180°-212°F) for 10 minutes sanitizes.

Lower temperatures or shorter time at the temperature will not properly sanitize or leave the equipment dry.

2 **Chemical agents** are effective only under four conditions (1) When the surface is entirely cleaned (2) when the surface is in intimate contact with the chemical (3) when there is sufficient concentration of the active constituent of the chemical and (4) when there is sufficient time of contact with the surface. The first three requirements are difficult to satisfy. Many mechanical washers do not

clean the surface sufficiently for chemical sanitizing agents. Pipe lines may appear to be completely filled with sanitizing solution and yet contain air pockets which will prevent complete sanitization. This is especially true of fittings, joints, and pumps. Also, vat covers may not come in contact with the chemical agent. The concentration of the solution will change if the chemical agent is not properly stored, or if it is used repeatedly, or if it is used for too many pieces of equipment.

Sanitizing Compounds—Bactericides, germicides, deodorant products

Sanose—A powder containing 80% pure casein and 20% albumose obtained from the white of egg. The powder possesses a slight taste and an odor suggestive of milk. By briskly stirring the powder with water, an emulsion may be made much resembling milk, but on standing it soon breaks up.

Santa Gertrudis beef breed is the first true breed of cattle evolved in America. They originated on the King Ranch in southern Texas as a result of crossbreeding the Indian Brahman cattle with the Shorthorns. The breed was stabilized with $\frac{3}{4}$ Brahman and $\frac{1}{4}$ Shorthorn. These large, beefy animals are predominantly red in color. They have practically the same mechanism for resistance to heat and to the Texas Fever tick as do the Brahman and therefore are popular in the southern states. The breed association requires each individual must pass inspection to be registered. Headquarters: Santa Gertrudis Breeders International, Kingsville, Texas. See Brahman Cattle.

Sap—The juices or fluid contents of a plant which circulate through the tissue of plants, such as sap from maple trees from which maple sugar is made. Also sap from sorghum plant from which molasses is made.

Sapid—Having strong agreeable flavor or savor, palatable.

Saponification—The chemical reaction between an alkali and an animal or vegetable fat resulting in soap. This is the same basic process which has been known for centuries in which wood ashes were leached to produce alkali, and the alkali combined with fats to produce soap.

Saponification Number (Koettstorfer)—The number of milligrams of potassium hy-

droxide (KOH) required to saponify 1 gram of fat. Also called the Saponification value which equals $\frac{\text{ml. N/1 KOH} \times 56.1}{\text{Wt. of fat in grams}}$

The saponification value for pure butterfat is usually around 228. Normal variations range from 226-230; extreme variations from 220-241. Used to identify possible adulteration of butterfat with other fats.

Saprophyte—A minute (usually vegetative) organism which lives on decayed matter.

Sapago Cheese—Saran—See Cheese.

Sarcina—Bacteria of the cocci family which divides on three planes so that the new cells are arranged in the form of a cube or packet and usually produce a yellow or orange pigment. One specie is found in milk and produces yellow spots.

Sardo (Sardo Romano)—Sarrasin—Sassenage Cheese—See Cheese.

Saturated Fatty Acids—Contain as much hydrogen as the number of carbon atoms can hold. All fats contain some saturated fatty acids but with different numbers of carbon atoms present. See Milk Fat.

Saturated Steam—Steam in the presence of water from which it is generated. It also refers to steam which is at the maximum pressure and density possible at its temperature.

Saturation—In *Breeding*, a belief that with the persistent use of a certain sire the later offspring tend to resemble that sire more than the first ones, and also that the dam tends to become more like the sire. The theory of saturation is really a statement of the cumulative effect of teleony and there is absolutely no evidence for it.

In *chemistry*, the absorption of a substance by another compound to satisfy a weak link in its structural formula.

In *meteorology*, containing as much water vapor per unit volume as possible at a given temperature.

Sausage—Meat, especially pork, ground and seasoned, and commonly forced into a tubular case made of the prepared intestine of some animal. Several types of artificial casings are in use.

Savage Feeding Standard—See Feeding standards.

Scab—Any of various bacterial or fungus diseases of plants frequently characterized by crustlike spots. A contagious disease like mange caused by a burrowing mite. The crust which forms by the drying of the discharge or pus from a sore or wound. To form a scab.

Scabrous—Rough to the touch.

Scalding (cheese)—See Cheese.

Scale—A weighing machine; an instrument for determining the relative weights of various substances usually by reference to standard units such as pounds, ounces, grams, etc.

Scale Board—See Cheese.

Scale Insects—Any of numerous small but very prolific insects; a bark louse. The young of both sexes suck at the juices of plants. Many of these are pests of cheese, flowers and of fruit trees.

Scandinavian Feed Unit System—See Feeding Standards.

Scanno Cheese—See Cheese.

Scarify—Scratch or chip seed or stir the surface of the soil with a scarifier. **Seed Scarifier**—A machine used to scratch or chip the relatively impervious coats of certain seeds, in order to insure better germination. **Soil Scarifier**—A machine in dryland agricultural areas used to tear up and partially pulverize surface soil.

Scaring the Milk—See Cheese.

Scarlet Fever—An infectious disease of man which can be transmitted to cattle and then back to man through the milk of the infected animal. The disease is caused by *Streptococcus scarlatinae*, a hemolytic form, and it is accompanied by fever and a rash, although this does not always hold true. The disease is very similar to septic sore throat, also caused by a streptococcus.

Scarmorze Cheese—See Cheese.

Schabziger—Schamser Cheese—See Cheese.

Schardinger Enzyme—See Xanthine Oxidase.

Schardinger's Test—Scharer Field Test—

Stharer Method of Phosphatase Test

Schern Test—See Dairy Tests.

Schlesische Sauermilchkäse—Schlosskäse—

Schloss—Schotte—Schottensied—Schützenkäse—Schwarzenberger—See Cheese.

Scoop in Cheese—See Cheese.

Scorched Flavor—See Milk and Cream Defects.

Score—In agriculture. A rating obtained by the use of a score card in judging livestock, dairy products, etc.

Score Card—A tally card on which to mark the score or rating according to definite standards.

Score Card for Dairy Cattle—See Reference Section, P. 311, 315.

Score Card for Dairy Plants—See Reference Section, P. 300.

SCORE CARDS FOR DAIRY PRODUCTS

Butter Score Card

Factors	Perfect Score
Flavor	45
Body and Texture	25
Color	15
Salt	10
Package	5
Total	100

Cheese Score Card

Factors	Perfect Score
Flavor	45
Body and Texture	30
Finish and Appearance (or make-up)	15
Color	10
Total	100

Cottage Cheese Score Card

Factors	Perfect Score
Flavor	50
Body and Texture	30
Composition
Color
Appearance	10
Salt	5
Package	5
Total	100

Cream Score Card

Factors	Perfect Score
Flavor and Odor	45
Bacteria	35
Sediment	10
Temperature	5
Container and Closure	5
Total	100

Ice Cream Score Card

Factors	Perfect Score
Flavor	45
Body and Texture	30
Bacteria	15*
Melting Quality	5
Color and Package	5

Total 100

*Deductions for bacteria per ml.

0-20,000 = perfect.

Milk Score Card

Factors	Perfect Score
Flavor and Odor	45
Bacteria	35
Sediment	10
Temperature	5
Container and Closure	5

Total 100

Scott Vacuum Evaporator—See Milk, Processing and Processing Equipment.

Scours—See Diseases in Cattle.

Scoville Sampler—A modified milk thief sampler used in taking samples of milk or cream from cans or vats. The sampler is so constructed that when it is inserted into the milk, the lower end when it strikes the bottom of the container closes automatically. Thus the sample is carried along when the thief is raised.

Scrapers (Ice Cream)—The revolving blades in an ice cream freezer which run next to the inner surface of the refrigerated shell, and prevent the formation of a frozen film on the shell.

Screenings—See Feeds and Feeding.

Scrub (Livestock)—A domestic animal of mixed or unknown breeding or parentage, usually without the type or markings of any particular breed; sometimes called a mongrel.

Scurs—Rounded portions of horn tissues attached to the skin at the horn pits of polled animals; often called buttons; should not be confused with horn stubs which are fastened to the skull.

Scurvy—A dietary deficiency disease. The victim loses weight, is anemic, pale, weak, and short of breath. The gums become swollen, bleed easily, and frequently ulcerate. The teeth loosen and may drop out. Hemorrhages into the mucous membranes and the skin are characteristic. The ankles become edematous and, in

severe cases, there develops a hard, board-like condition of the skin and subcutaneous tissues.

Seal-Cone—A trade name for a paraffined paper cone or container for milk.

"Sealtest"—A brand name, symbol of quality, copyrighted by National Dairy Products Co., Inc., and used on such products as ice cream, milk and milk products, butter, oleo, etc., as "Sealtest Milk," "Sealtest Cottage Cheese," "Sealtest Ice Cream," etc. regardless of the company within National Dairy that may have manufactured the product. Said by National Dairies to be legally protected and backed up by a vigorous and highly exacting and demanding program of inspection, quality control and analysis, and laboratory operation. Permission to use "Sealtest" within National Dairy is granted only to those subsidiaries who have shown an ability and have the physical facilities to comply with the Sealtest requirements. Permission is granted on a 3 way contractual agreement basis, between the operating subsidiary, National Dairy Products Co. and the Plant Production Division of National Dairy Products Inc.

Seam Cheese—See Cheese Defects (Color-Cheddar).

Season—A period of time which is normal for growing an agricultural crop and a general type of weather prevails.

To dry lumber either in the open air or in a kiln.

Seborrhea—See Diseases in Cattle.

Second Growth—The growth developing after another growth or on land devoted primarily to some other crop.

Secretion of Milk—See Milk Secretion in Handbook Section, P. 46.

Secility—Sextilometer—See Cheese.

Sediment—In milk indicates some carelessness and possible contamination.

Milk is scored as to sediment present, it being determined by taking a sediment test of a pint of the milk and observing the resulting sediment disc. Sediment is allowed 10 points on the milk score card, and, in order to have the milk score the full 10 points, it must show no trace of any foreign particles. One-tenth of a point should be deducted for every 2 particles of dirt that may be seen. When

there are so many dirt particles that they cannot be counted easily, the relative shade of the disc should be compared with the standard discs and scored accordingly. Normal milk ranges from 7 to 95 points on sediment.

Sediment Disk—A small cotton disk about 1 in. in diameter, used in the various sediment testers when sampling milk for sediment.

Sediment Test—**Sediment Test for Cheese**—**Sediment Tester**—See Dairy Tests.

Seed—Grown for the production of seed, as, a seed crop, selected or used for planting to produce a new crop. The propagative portion of a plant, whether of true seedlike fruits or of tubers, bulbs, etc.

Botanically the small body produced by flowering plants which contains an embryo capable of developing by germination, fertilized and ripened ovule.

Seed, Certified—See Certified Seed.

Seed Down—Generally to establish a permanent pasture or perennial legume for hay.

Seed Treatment—The treatment for the destruction of seed borne parasites before planting of seeds, tubers, bulbs with dust or liquid fungicides, hot water, dry heat, etc.

Seeded—Supplied with cultures or seeds.

Seedling—A very young plant in its early stages of development from a seed.

Segregation—In genetics the process by which genetic factors become separated and included in different gametes in the process of gametogenesis.

Selection—Biologically any process natural or artificial, which permits certain individuals to leave a disproportionately large number of offspring in the group, or prohibits others from leaving offspring, the result being to increase the frequency of heritable factors possessed by the favored parents.

Selection Differential—A measure of the intensity of selection and consequently an indication of the rate of progress that can be expected in improving a group of animals. Obtained by subtracting from the average value of the individuals selected to be parents for the next genera-

tion, the average value of the group from which the parents are chosen.

In practice, the necessity of raising most of the female calves merely to replace the losses in the herd due to disease and reproductive difficulties limits the opportunities for rapid progress because of the low selection differential.

Selenium Poisoning—See Diseases in Cattle.

Self fed, Self feeder—An animal reared cafeteria style, that is by the use of a self feeder. This labor saving device for feeding livestock is equipped with a feed hopper which automatically supplies a trough below.

Self fertile—Biologically fertile by means of its own pollen, self pollinated, said of certain flowers, the pistils of which are fertilized by pollen from the anthers.

Self pollinated—Pollinated by the anthers of the same flower, called self fertile flowers.

Self sterile—Biologically, sterile to its own pollen.

Self-sucking—A habit, sometimes acquired by cows of sucking their own teats. While this practice is usually not harmful, it is unprofitable for the dairyman. Cows may be broken of this habit by the use of a calf weaner on the cow, by a crib or rigid collar, or by a stout stick which passes between the front legs and connects the bottom of the halter with the lower part of a girdle fitted comfortably around the cow's body.

Semen—The viscid whitish fluid produced in the male reproductive organs, which contains the spermatozoa needed to fertilize the egg, or ovum, of the female.

Semen Extenders in Artificial Insemination—Fluids used to dilute the semen to obtain a greater volume. Most commonly used diluters are boiled milk, egg yolk-citrate and egg yolk phosphate.

Semen, Frozen—Semen which is frozen and kept at -79°C , and thawed out when needed. See Handbook article on Artificial Insemination, P. 31.

Semen, Post freezing (or Post thawing) Motility—The per cent of motile sperm in a semen sample after freezing, storage, and thawing.

Semen, Pre-dilution of—Bovine semen is usually diluted immediately after collection. In some cases this is a low rate of dilution (e.g., 1 pt. semen: 4 pts. diluter) although final dilution may be 1:100 or more.

Semen, Pre-freezing Motility of—The per cent of motile sperm in the sample (usually glycerolized) just before the freezing process is started.

Semi-diesel Engine—Term frequently applied to engines capable of burning distillate oils or Diesel fuels by assistance of a hot bulb, hot tube, hot plate, or spark plugs.

Semi-official Test—A method of obtaining milk and butterfat production records of a cow, where the dairyman weighs the milk himself during most of the period of the test. A supervisor visits the herd and weighs and tests the milk once monthly or bi-monthly, and from these weights and test the production of a cow is calculated.

Semi-Solid Buttermilk—See Milk, Buttermilk.

Sénecterre Cheese—See Cheese.

Senescent Phase—See Resting Phase.

Senses Test (New Zealand)—See Cheese.

Sensible Heat—That portion of the total heat of a body which can be felt or measured by the rise in temperature as indicated by a thermometer. It is the heat required to raise the temperature of the liquid milk from any given temperature to its boiling point. It requires 1 B.t.u. to raise 1 lb. of H₂O (water) 1°F. Since the specific heat of milk is .93, it requires .93 B.t.u. to raise 1 lb. milk 1°F.

Sensitization—In chemistry, the phenomenon of an increased sensitivity to flocculation by electrolytes of hydrophobic sols, e.g., when a non-electrolyte has been added.

Separated and Churned Texture—See Defects of Dried and Evaporated Milk.

Separating Drum—See Cheese.

Separator, Separator Float—See Milk Processing and Processing Equipment.

Separator Milk—See Milk and Cream.

Separator Slime—See Milk and Cream Defects.

Sepsis—See Diseases in Cattle.

Septic Sore Throat—A pathogenic infection of man quite often spread by milk. Some outbreaks have been extremely virulent with an abnormally high death rate. In recent years the mortality has been greatly reduced by the use of newer drugs. The infection is caused by hemolytic streptococci thought to be of human origin although they have the power of establishing themselves in the cow's udder and multiplying there. Sometimes transmitted by a "carrier" of the disease who is in close contact with milk or other food products.

Septic Sore Throat Mastitis—See Diseases in Cattle.

Septic Tank—For sewage disposal, a tank in which the solid matter of continuously flowing sewage is deposited and retained until it has been disintegrated by anaerobic bacteria.

Septicemia—See Diseases in Cattle.

Septomoncel Cheese—See Cheese.

Sequestering Agents—Water softening materials which have the ability to form soluble complexes with the ions of earth alkalies, which cause water hardness, and with heavy metal salts.

Sequestration—The process by which water softeners act on the hardness salts in water to keep them in solution so they will not precipitate on the utensils or equipment to cause corrosion.

Serine—HOCH₂CH(NH₂)COOH. An amino acid found in the protein of milk. Casein contains about 6.5 and B-lactoglobulin about 5.0 gms. per 100 gms.

Serology—Has to do with preparation and use of serums.

Serra da Estrella Cheese—See Cheese.

Serrate—Resembling saw teeth. Said of leaves having sharp teeth-like projections pointing forward.

Serum—The watery portion of an animal fluid remaining after coagulation—as blood serum (after coagulation of the corpuscles)—which may be used for transfusions or

as immune blood which contains certain immunizing bodies such as anti toxins or agglutinins
See Milk and Cream—Serum of Milk

Serum Pour Method—The simplest and shortest method for ice cream batch proportioning. It involves only straight arithmetical banding of two formulas with minor intervening steps and a final simple subtraction.

Serum Proteins—See Milk and Cream

Serum Separation—See Milk and Cream Defects

Serum Solids (S.S.)—The moisture free milk solids not fat—includes protein, lactose, and minerals. See Ice Cream

Servian Cheese—See Cheese

Service Charge Plan—Often used to describe a method for purchasing cream at cream stations. The central creamery fixes the price for butterfat. The station operator's compensation is included in this price. To cover other overhead expenses of the station, a service charge about 30¢ (more or less) per delivery is asked of each farm patron.

Sesame Oil—A semi-drying vegetable oil extracted from the seed of an East Indian herb, *Sesamum indicum*. Sometimes used as a food, also as a substitute for butter fat in buttermaking and ice cream making though not legal in very many places.

Set Milk—To set milk in open pans in order that the cream may rise to the surface by gravity. To allow milk to ripen with or without the addition of a starter or an enzyme. To curdle milk as by rennet.

Setons—Devices for setting up counter irritation and supuration in the skin of animals in the treatment of certain diseases. A sterile piece of string, tape, or other such material, is drawn under the skin by means of a needle and the two ends tied together to secure it in place. Usually the seton is drawn back and forth every day, thereby causing constant irritation. In some cases the seton is saturated with turpentine or other irritating material for the purpose of intensifying the action. The opening where a seton is inserted should be kept clean.

Seven Day Official Test—Weigling sampling and testing of milk by a represent

ative of an agricultural college or experiment station, every day for seven days. Obsolete except for milk testing history. Officially discontinued.

Sex—One of the two divisions of organisms formed on the distinction of male and female, males or females collectively.

Sex-chromosome—A chromosome other than the autosomes and one which has been identified with one or the other of the sexes. One member of a pair of chromosomes which differs morphologically or physiologically from the autosomes and carries a factor or factors for sex.

Sex limited—This term is generally applied to characters, such as milk or egg production, which are exhibited by one sex only.

Sex linked—Applied to factors located on the sex chromosome or to the characters conditioned by them. The linkage of a factor with the factor or factors concerned with sex determination.

Sex ratio—The proportion of males to females of a population.

Shackle—A hobble for a horse.

Shallow Pan Method—See Milk Processing and Processing Equipment

Shallu—See Feeds and Feeding

Shank—In dressed beef, a cut from the upper part of the foreleg the corresponding cut from the hind leg usually being called the hind shank, also, a cut from the foreleg of sheep or the hind leg of veal.

Shaping—See Cheese

Share Crop—A crop raised by a tenant farmer who pays rent with part of his crop. To farm on a share basis—paying an agreed share of crop raised.

Shea Butter—A greenish white solid vegetable fat from the nuts of an African tree—(*Butyrospermum parkii*) containing oleic and stearic acids, the content of fat being about 46%. It is used as a lard substitute, chocolate fat and in candle making.

Sheaf—A number of stalks, ears or heads of corn or grain, as wheat, oats, rye, etc., bound together.

Sheath—In grasses, the lower part of the leaf which envelopes the stem or culm.

The tubular fold of skin into which the penis of various animals is retracted.

Shed—A place of shelter for animals

To cast or throw off, as a natural covering of hair, horns, feathers, etc.

Sheep—A ruminant animal, allied to the goats, usually domesticated, kept for their flesh, wool and skin, and in some countries for milk. There are many breeds.

Sheep Manure—Excrement of sheep having an analysis of 2.25% nitrogen, 1.0% phosphoric acid and 2.0% potash; used widely in vegetable gardening. It has been said that "The sheep's hoof is golden."

Sheepskin—The skin of a sheep; also, leather prepared from it; parchment.

Sheet Erosion—The gradual uniform removal of soil from an entire field surface by the agencies of erosion, water and wind.

Shelf-cured, (forced-cured, fast-cured, warm-cured)—**Shelf-life**—See Cheese.

Shell Eyes or Holes—See Cheese Defects (Swiss).

Shellac—A yellow, orange, or reddish, (white when bleached) lac resin; used in varnish and many other products. A preparation of lac dissolved in alcohol, used in filling wood, as a varnish, etc. Often used as a first or ground coat on paint jobs. To coat or otherwise treat with shellac.

Sherbets—Sherbet or Stock Mix—Difficulties and Defects of—See Ice Cream

Sherbides—See Ice Creams

Shetland Sheepdog, also **Sheltie**—A miniature collie dog originating in the Shetland Islands; 12 to 15 inches high; weight 12 to 18 lb; color black and white with tan markings, also black and white, black and blue gray.

Shipping Fever—See Diseases in Cattle

Shipping Station—A centrally located point, usually adjacent to a railroad or trucking center, to which milk or cream is brought by producers prior to being shipped direct to the city. These stations may be anything from a small platform to a well constructed shed and should be

covered if possible to protect the milk from the sun.

Shock—A pile or assemblage of sheaves of grain, as wheat, oats, rye, or the like, set up in the field, with the butt ends down, the sheaves usually varying in number. Often one or two are used as caps to protect from weather.

Shock Corn—See Feeds and Feeding.

Shock Treatment of Milk—See Cheese.

"Shocking"—See Milk, Processing and Processing Equipment

Shomar—Name applied to Jewish official who checks on the handling of Kosher milk.

Shoot—A very young and vigorously growing stem or branch of a plant.

Short—Stock market term

A trader is said to be in a short position if he owes on stocks or commodities. A term generally applied to one who believes the price trend is downward.

Short Body—See Cheese Defects (Body-Cheddar)

Short-fed—In beef cattle feeding means being kept on a fattening ration for a period of only 60 to 90 days.

Shorthorn—The Shorthorn developed in England is the largest of the beef breeds; weight 1200 to 1400 lb. The rectangular shape is more or less characteristic. Their color may be red, white, or any combination of red and white, but roans (blended red and white hairs) are most numerous. Of all the beef breeds the Shorthorn excels in milk production, a factor which has made them favored on many small farms. See Breeds of Dual Purpose Cattle.

Also see article in Handbook Section, P. 272

Short Time—High Temperature Pasteurization—See Milk, Processing and Processing Equipment.

Short Yearling—A young beef animal approaching one year in age, especially one between nine and twelve months old.

Shorts—See Feeds and Feeding.

Shot-Gun Can—See Milk, Processing and Processing Equipment.

Shot Holes—Shotty Curd—See Cheese.

Show—A public exhibition as livestock and grain shows

Show Animals, Feeding of—See Feeds and Feeding

Shredded Corn—See Feeds and Feeding

Shredder—A machine which husks shocked corn and shreds and cuts the stalks and husks

Shrimp Meal—See Feeds and Feeding

Shrinkage of Cheese—See Cheese

Shrock—See Feeds and Feeding

Sialagogue—A drug used to promote the secretion of saliva

Sickle Hocks—A fairly common easily recognizable defect in cattle, horses and hogs. It is a condition of bent hocks, the rear feet thus being placed too far under the animal's body, instead of being placed squarely or vertically under the tail. Sickle hocks are very objectionable because they are considered a structural weakness and obviously not as stout as straight hocks.

Side Dressing—The application of fertilizer to a crop during the growing season. A method of applying fertilizer near to plants.

Sideration—The practice of using green manure.

Sight Glasses—See Butter Churn

Silage Cutter—A machine equipped with blowers for cutting silage and usually elevating it into a silo. Also called a silo filler.

Silage-Preservatives and Conditioners—See Feeds and Feeding

Silesian Cheese—See Cheese

Silicates—Silicates of some metals as constituents in washing powder, are added to render protection to the machinery parts in contact with the solution.

Silicones—Synthetic chemicals produced in many forms, such as fluids, resins, greases and rubbers. Their molecular make up combines much of the heat stability and oxidation resistance of sand or glass with the flexibility and handling ease of many organic materials. They have many applications in the food industry, one, they are used to kill foam and for this purpose ten parts per million is recom-

mended. Another silicone is applied on metal surfaces to make cleaning more easily accomplished. A silicone product is in the form of a protective hand cream. It is said to protect the hands from water borne irritants and to combat problems of skin irritation.

Silo—Originally a pit or vat, now usually a circular structure of wood, concrete, tile block, steel, vitrified glass, etc., for packing away green fodder, grass, etc. to convert it into silage.

Several types of silos are in use as follows:

1 Upright, above ground permanent silos as described above.

2 Temporary, above ground often made of snow fence material.

3 Bunker top-of-ground silos with walls 6 to 8 ft high made by setting creosoted posts 4 ft in the ground and 6 ft apart in two parallel rows, and lining the rows with 2 inch tongue and grooved creosoted planks. They have the advantage that they can be built near the cow yard on nearly level ground to secure greater convenience in self feeding. Offsetting this is their higher cost compared with earth bank silos. Some spoilage occurs along the sides of bunker silos unless the planks are pressure joined airtight. Outward sloping walls of around 1 ft facilitate tight packing and settling of forage against the wall and results in negligible side spoilage if the walls are airtight. If the walls are not tight they should be lined with airtight asphalt or plastic sheets.

4 Pit Silos (horizontal) are generally built on the ground or underground. The permanent ones are generally concrete lined.

5 Trench Silos are inexpensive to construct and are most popular in sections of the country where dairying is new.

They are generally constructed in places where drainage is fairly good and where the soil can be fairly easily removed with the use of a tractor or steam shovel. They are easy to fill, packing can be handled with a tractor. They offer a cheap method for putting away increased amounts of silage in a good year of crops and holding as an insurance against years of poor crops.

Silo Carbon Dioxide Poisoning—As the silo is being filled, fermentation process produces carbon dioxide. This gas is dangerous. As this is a heavy gas it does not readily pass off, but settles to the

bottom, unless the blower is operating. Therefore unless the doors near the level of the silage are open, one should not enter the newly filled silo until the blower has operated sufficiently long to remove possible gas accumulated.

A lantern will not burn where there is an accumulation of carbon dioxide gas; hence, some people follow the practice of lowering a lighted lantern into the silo if the newly filled silo has been standing overnight or for longer periods without taking the precautions mentioned. Most of the gas develops within a period of 12 to 24 hours. Since it forms near the surface of the silage, a good practice is to keep the doors open to this level while the silo is being filled and for a brief period thereafter.

Silos—Size and Contents Table—See Reference Section, P. 308.

Silo Unloaders—Devices for taking silage out of the silo to feeding area. One type consists of a movable, adjustable, self-feeding manger set in front of a bunker or trench silo. Another type is a tractor mounted forking device by which silage may be placed directly in the manger. In air-tight silos patented power equipment which takes the silage from the bottom of the silo is used.

Silt—Mineral soil material of very small size, grading from very fine sand to clay, and having a particle diameter of 0.05 to 0.002 millimeters.

Simple Ice Cream Mixes—See Ice Cream

Sinacid Test—See Dairy Tests

Single Acting Compressor—See Refrigeration.

Single-service Package—See Ice Cream.

Single Strain Starter—See Cheese

Singles—See Cheese.

Siphon Trap—The most satisfactory of the ventilated traps. It is usually placed in a local sewer near its point of entrance into the main sewer.

Sir Iz Mjesine—Sir Mastny—Sir Posny—Siraz—See Cheese.

Sire—The male parent of an individual.

Sire Index—A figure that is thought to be indicative of the milk and fat production transmitting ability of a sire.

Sizes of Cheddar Cheese—See Cheese.

Skanausia Suria—Skewered Cheese—See Cheese.

Skimming—Removing the top of a liquid, as a scum, cream, etc. Separating cream from milk by means of a centrifugal separator or skimming by hand.

Skim Milk—See Milk

Skim Milk Powder—Skim Milk Screw—See Milk, Processing and Processing Equipment.

Skim Milk Test—See Dairy Tests.

Skin Formation on Milk—The thin layer that appears on milk when it has been heated. Analysis shows this to consist of albumin, casein, and calcium phosphate and some fat, all in very small quantities.

"Skipo"—A term meaning "skim milk powder," "powdered skim milk," etc., now officially termed "nonfat dry milk."

Skorup-Skuta-Skyr—See Milk—Fermented.

Slab-sider—Said of an animal that is flat-ribbed.

Slaked Lime ($\text{Ca}(\text{OH})_2$)—See Hydrated Lime.

Slaughter Animals—In marketing, animals with sufficient fat or finish to meet the requirements of the meat consuming trade.

Sheek (in livestock)—Having a smooth, glossy surface, as hair on cattle, horses, etc., obtained by good feeding, brushing, rubbing, etc.

Slender Wheat-Grass—See Feeds and Feeding.

Slime—See Milk and Cream Defects.

Slimy Milk—See Ropy Milk.

Sling Unloader—A hay unloader consisting of a rope sling which is laid on the wagon rack and on which the hay is placed. When unloading, the ends of the sling are pulled together and the half or entire load of hay lifted and transported to the mow or stack by track, block, tackle, and the like.

Slink—Slinking Calf—The young of a beast brought forth prematurely; especially, a calf brought forth before its time; also, the flesh or skin of such a calf. Same

as slipping' the calf A colloquial expression used to denote aborting of a calf

Slip—To lose by abortion or miscarriage

Slip Cheese—Slipcore Cheese—See Cheese

Slip Coat—Slippers—Slit-openness—See Cheese Defects (Texture)

Slop—See Feeds and Feeding

Slop Dairy—A dairy where cows are fed on the slop or refuse from distilleries or canneries

Slope—The inclination of land from the level The rise or fall of land

Sludging in Homogenized Milk—See Milk and Cream Defects

Small Eyed—See Cheese Defects (Swiss)

Small Grain—See Feeds and Feeding

Smear Growth—Smear Ripened—See Cheese

Smell—The sense of smell and taste are both made use of by judges in checking on the flavors and palatability of all dairy products and also of milk as it is being received for processing

Smoked Cheese—See Cheese

Smother Crop—Usually a fast growing crop such as mullet sudan grass or winter cereals, sown for the purpose of suppressing persistent weeds

Smudged Type of Mold—A characteristic type of mold occurring in butter In this type of mold there are dark, smoky, or rarely greenish colored areas, suggesting soot or dirty finger marks Sometimes hyphae are observed 4 or 5 mm below the surface.

Smut—Any of certain destructive diseases of various plants especially cereal grasses, caused by parasitic fungi, characterized by black, often dusty, masses of spores, also, any fungus producing such a disease.

Smut, Covered—A cereal disease in which the grain itself is destroyed but the glumes remain healthy

Soap—Rudimentary horns on an animal

Soap—To harvest by pulling off as the ears of corn or the open bolls of cotton.

Soapy Texture—See Ice Cream Defects.

Soaked Curd Cheese—Soaked Curd Method—See Cheese

Soaker Tanks—Milk bottle washing machines One type has one large tank, an other type has six tanks The latter type has the necessary washing and rinsing equipment

Soaker Type Bottle Washer—A type of milk bottle washer in which the bottles are removed from the cases and fed into the washer where they are soaked and sprayed with two or more solutions containing strong alkali The bottles are next brushed and then rinsed The final rinse often contains chlorine as a disinfecting agent After coming from the washer the bottles are transferred directly to the fillers

Soap—Soap as a constituent in washing powder, has poor water softening power, poor washing power, but excellent emulsifying properties It is hard to rinse, has mild action on metals and hands, and is apt to leave scum in bottles

Soapweed—See Feeds and Feeding

Soapy Flavor—Soapy Taste—See Milk and Cream Defects

Socket—An opening or hollow that forms a holder for something as an incandescent light socket

Soda Ash—See Sodium Carbonate

Soda Fountain Terms—See Ice Cream

Soda, Modified—A mixture of sodium carbonate and sodium bicarbonate Properties combine those of its components

Sodium—Na. An alkali metal present in milk to the extent of about 0.50 g per liter

Sodium Alginate—A vegetable product extracted and prepared from *Macrocystis pyrifera*, the giant kelp of the Pacific Ocean It is used in the dairy industry as a stabilizer, particularly for ice cream and chocolate milk. It is also known to the trade as *Danloid* or *Kelco Gel*

Sodium Bicarbonate— NaHCO_3 , Baking soda. A sodium salt often used in neutralizing cream, ice cream mix, and other dairy products of high acidity It is also used to a limited extent as a dairy washing powder

Sodium Carbonate— Na_2CO_3 , Soda ash. An alkaline salt sometimes used as a neutralizer. Also as a washing powder it has good softening power, greatly aids washing mechanism, is a poor emulsifying agent, rinses very easily, has slow action on tin and very mild action on hands, and neutralizes odors.

Sodium Caseinate—A hydrated casein product made by the addition of sodium salts to calcium caseinate or cottage cheese curd. Used in ice cream manufacture as a source of lactose free serum solids and in some cases to improve whipping ability of cream.

Sodium Chloride— Na Cl Common salt, a white crystalline compound occurring abundantly in nature, both as a solid and in solution form. It is necessary as a mineral supplement in human and livestock feeding. It also has many industrial uses.

Sodium Glutamate—Gluconic acid and its corresponding lactones.

Sodium Hexametaphosphate (Na PO_3)₆—An effective water softening material. When used in conjunction with other alkaline detergents, it adds its water softening ability to the detergent ability of the other alkalies.

Sodium Hydroxide NaOH (Caustic Soda)—A base or alkali commonly employed in chemical work. A white solid, easily soluble in water, resulting in marked evolution of heat. It is strongly alkaline and is used as a cleaning and sterilizing agent in bottle washers. It is a good dissolver and deflocculator, but a poor water softener and has a poor emulsifying effect. It acts upon hands and metals and is difficult to rinse. A tenth normal (0.1 N) solution of sodium hydroxide is used in titrating milk for acidity by Mann's test.

Sodium Hypochlorite, NaClO —A popular chlorine disinfectant for sterilizing dairy equipment. Made by electrolysis of brine, by passing chlorine into a dilute solution of sodium hydroxide, or by the addition of soda ash to calcium hypochlorite. Sold under such trade names as B K, Diversol, etc.

Sodium Lactate—The sodium salt of lactic acid ($\text{CH}_3\text{CHOHCOONa}$).

Sodium Metasilicate—An alkali ($\text{Na}_2\text{SiO}_3 \cdot 5\text{H}_2\text{O}$) used as a water softener. It also

precipitates water hardness, provides reserve alkalinity and acts as a buffering agent in cleaning compound formulations.

Sodium Nitrate (NaNO_3)—A water soluble nitrogen fertilizer, containing approximately 16% nitrogen in a readily available form.

Sodium Propionate—Mycoban—Mold Inhibitor—The sodium salt of propionic acid ($\text{CH}_3\text{CH}_2\text{COONa}$), often used as an inhibitor of molds, particularly on parchment wrappers for butter.

Sodium Sesquicarbonate—A chemical mixture of sodium carbonate and sodium bicarbonate and its chemical formula is $\text{Na}_2\text{CO}_3 \cdot \text{NaHCO}_3 \cdot 2\text{H}_2\text{O}$.

Sodium Silicate—See Washing Powders.

Sodium Zincate—As a constituent in washing powder, it is sometimes added for protection of zinc parts.

Soft Cheese—See Cheese

Soft Coro—See Feeds and Feeding

Soft Curd Milk—See Milk

Soft Curd Vitamin D Milk—Mineral modified fluid milk enriched with added vitamin D. Said to be more rapidly digested than regular milk. Available in some markets.

"Soft" Ice Cream—See Ice Cream Formulas

Soft Water—Water containing practically no calcium and magnesium salts. Such water is best adapted for dairy purposes for it causes no scale or sludge formation. Soft water contains not over 10 grains of solids per gallon. See Hard Water.

Soury Body—See Ice Cream Defect.

Sogo Ice Cream—See "Ice Creams and Other Frozen Desserts."

Soil—Farmland, earth, ground; the upper layer of the earth's surface, composed of organic and mineral materials, in which plants grow.

Soil Acidity—A soil with a high hydrogen ion concentration. A sour soil; not sweet; lacking calcium and magnesium. Soil with a pH of between 3 and 7.

Soil, Alkaline—A "sweet" soil; a soil containing enough calcium and magnesium (sometimes sodium) to give it a pH greater

than 70 Such soils occur extensively in arid and semi arid sections of the country

Sod Auger—A tool for boring into the sod and withdrawing a small sample for field or laboratory observation, augers are of two general types those with worm type bits and those of a hollow cylinder type with cutting edge at one end

Sod Classification—Study of soils and their interrelationships, description of their properties, naming and grouping them systematically The taxonomic (classification according to natural relationships) units are frequently regrouped for various purposes such as drainage requirements crop adaptations highway construction or forestry purposes

Soil Conservation—Protection of the soil from losses through erosion and leaching

Sod Conservation Service (SCS)—The technical agency of the U S Department of Agriculture in matters affecting soil and water conservation was established in 1935 under authority of the Soil Conservation Act and is charged with the responsibility of developing and carrying out a permanent national soil and water conservation program Its principal duty is to assist farmers and ranchers in locally organized and farmer directed soil conservation districts through its planning technicians and other soil and water conservation specialists

Soil Improvement—The processes for or the results of making the soil more productive for growing plants by fertilization, drainage addition of organic matter, irrigation and the like

Soil Life—The microorganisms found in soil

Soil Map—A map designed to show the distribution of soil types or other soil mapping units in relation to the prominent physical and cultural features of the earth's surface

Soil Morphology—1 The constitution of the soil body as expressed in the kinds, thicknesses and arrangement of the horizons in the profile and in the texture, structure, consistence, porosity and color of each horizon

2 The properties, collectively, of the soil body or any of its parts (Includes physical, chemical, mineralogical and biological properties)

Soil Mulch—A dust mulch

Soil Population—All of the organisms living in the soil the combined soil fauna and flora

Soil Productivity—The ability or capacity of a soil to produce good crops under proper management

Soil Profile—A section downward through a soil showing the well defined layering, each individual section or layer is called a horizon

Soil Reaction—The degree of acidity or alkalinity of a soil as determined by the use of a suitable indicator or electrode

Values usually expressed in terms of the pH scale

Soil Sickness—A condition of soil resulting from overcropping or from heavy infestation with parasites or weeds which prevent or inhibit the growth of a crop Can usually be corrected by proper cultural management

Soil, Structure of—The way in which soil particles are aggregated or held together

Soil Testing—An analysis to find out what plant food elements are lacking to determine the degree of acidity one of several types of tests to determine soil acidity or alkalinity A test to determine both the chemical and mechanical properties of a soil

Soil Texture—The relative coarseness or fineness of a soil In textural designations such terms as sandy clay and loam are used

Sodding—The practice of feeding stock in barns or enclosures with fresh grass or green feed cut for them This practice is common in an intensive system of agriculture where land is high in price

Soiling Crop—See Feeds and Feeding

Sol—The general name for a colloidal solution

Solclime—The temperature and moisture conditions of the soil, the soil climate

Solid Carbon Dioxide—See Dry Ice

Solidify—To change from a liquid to a solid state, as from water to ice

Solidifying Point (Solidification Point)—As usually applied to fats and oils, the

temperature at which a fat or oil changes from a fluid or liquid state to a solid. The solidifying point of milk fat varies from 19 to 24.5°C (66.2 to 76.1°F). The solidifying action in milk fat does not take place at a definite temperature since the material in question is not a pure compound, but a mixture of various triglycerides of fatty acids.

Solids—See Milk Solids.

Solids Not Fat (S.N.F.)—The total solids percentage of dairy products minus the fat percentage. Solids not fat present in milk mean the total solids minus butterfat and may be approximately estimated by the following formula: S.N.F. equals $\frac{1}{4}$ the corrected lactometer degrees plus 0.2% fat.

Solubility Index of Milk Powder—The amount of sediment remaining in a centrifuge tube after milk powder has been dissolved in water and centrifuged according to standard methods.

Solubility of Milk Powder—It is very important that milk powder be readily soluble as its market value is materially affected by its solubility.

The solubility of milk powder implies a product that is capable, when mixed with water in proportion resembling the percentage composition of normal fluid milk, of returning to a solution, suspension and emulsion that will simulate the physical characteristics of natural milk. Several methods are used to determine solubility. However, apparently, one of the most satisfactory methods has been suggested by the American Dry Milk Institute, Inc. of Chicago, Ill. Details of solubility index test can be secured from the institute.

Solubility Product—The product of the concentrations of the ions of a substance in a saturated solution of the substance.

Solution—A homogeneous mixture of two or more substances. The dispersion is so fine that particles of the dissolved substance are dissolved as individual molecules or ions and cannot be detected even with the aid of an ultra-microscope.

Solvent—That constituent of a solution which is present in larger amount; or the constituent which is liquid in the pure state, in the case of solutions of solids or gases in liquids. See Disperse Medium.

Soma—The body; in contrast with the germ or germ plasm.

Somoplasm—The protoplasm other than the germ plasm.

Somatic Cells—Muscle cells as distinct from germ cells.

Somatoplasm—The body tissues.

Sonic Homogenization (Sonic Oscillation)—See Milk, Processing and Processing Equipment.

Soporific—A substance which is conducive to sleep. Hot milk has this property.

Sorb—Chem. To take up and hold either by adsorption or absorption.

Sorbic Acid—See Cheese.

Sorenson's Titration—See Dairy Tests.

Sorghum—Sorghum Silage—Sorghum and Cowpea Silage—Sorghum and Soybean Silage—Sorghum-Stover Silage—Sorgo—See Feeds and Feeding.

Sorption—Chem. The act or process of sorbing. A general term used to include absorption and adsorption under the one phenomenon. See Sorb.

Sotol—See Yucca.

Sounding-Spooning (in cheese)—See Cheese.

Sour Concentrated Skim Milk—See Milk, Processing and Processing Equipment.

Sour Cream Body Tester—See Dairy Tests —Hilker-Guthrie Sour Cream Body Tester.

Sour Milk—Milk in which the acidity has increased so as to be detected by smell or taste. There are varying degrees of sourness from approximately 0.18% lactic acid to the thick sour milk, clotting at room temperature containing approximately 0.60% or more lactic acid. The souring process is due chiefly to the growth of bacteria, usually *lactic streptococci* and *coliform*, in the milk.

Souring Period of Milk—The second period in the normal fermentation of milk. During this time many types of microorganisms grow actively but the milk-souring type predominate and bring about the change of lactose into lactic acid while other changes are taking place to a lesser degree. The souring may continue for several hours or several days.

but will reach a maximum when so much acid has been produced that the bacteria which have been responsible for it are inhibited in their growth.

This occurs at about 1% acidity. See Germicidal Period, Neutralization Period, and Putrefaction Period.

Southern Bur Clover—See Feeds and Feeding.

Soxhlet Apparatus—A glass appliance used for the extraction of fat by the action of volatile solvents.

Soybean—See Feeds and Feeding.

Soybean Flour—Soybeans processed to make a flour for culinary use.

Soybean Meal—Protein meal used in animal feed supplements.

Soybean Milk—An imitation milk made from soybeans.

Soybean Oil Meal—Soybean Silage—Soybean Straw—See Feeds and Feeding.

Soyco (Whitson's)—Whipping agent made from soy albumen. Designed for use in candy manufacturing to improve texture of mix.

Spaddling—An old process of scraping the frozen ice cream from the walls of the freezer with a spatula. The original method of freezing consisted in packing a closed container, holding the ice cream mix, in a mixture of salt and broken ice, and removing the ice cream from the sides of the container from time to time by scraping it off with a spatula. This process was known as spaddling.

Spalen Cheese—See Cheese.

Spanish Bayonet—See Feeds and Feeding.

Spatula—A flat blade used in laboratories for transferring solid or pasty substances from one container to another.

Spay—To remove the ovaries of a female animal. A spayed heifer is an unsexed heifer, the ovaries having been removed through incision made in front of the left hip.

S.P.C.A.—Society for Prevention of Cruelty to Animals, American; organized in 1866. Headquarters, 411 East 92nd Street, New York 23, N.Y. See Red Star (International Organization).

Specialty Goods—In ice cream, these are goods that have such a special attraction to the buyer that he will go out of his way to make the purchase.

Species—A natural group of animals or plants which have in common one or more distinctive inherited characters by which they may be differentiated from other species; a subgroup of a genus; the smallest group to which distinctive and invariable characters can be assigned. Each genus contains one or more species and each species may contain (usually does) one or more breeds or varieties.

Specific Gravity—The weight of a solid or liquid at a specified temperature compared to that of an equal volume of pure water at a specified temperature. The specific gravity of whole milk at 60°F. compared to water at 60°F. is usually within the range of 1.027 to 1.035. For evaporated milk at 60°F. the range is 1.05 to 1.075 at 15.5°C.

The specific gravity of gases is usually expressed as the weight of gas compared to that of an equal volume of air at the same temperature and pressure.

Specific Heat—The ratio between the amount of heat required to raise a given weight of substance to a given temperature and the amount of heat required to raise the same amount of water to the same temperature. Milk has a specific heat of 0.938 at 59°F. (15°C.).

SPECIFIC HEAT OF MILK AND MILK PRODUCTS

	at 0°C. at 15°C. at 40°C. at 60°C. (32°F) (59°F) (104°F) (140°F)			
Whey	0.978	0.976	0.974	0.972
Skim milk	.940	.943	.952	.963
Whole milk	.920	.938	.950	.918
15% cream	.750	.923	.899	.900
20% cream	.723	.910	.880	.886
30% cream	.673	.983	.852	.860
45% cream	.606	1.016	.787	.793
60% cream	.560	1.053	.721	.737
Butter	.512*	.527*	.556	.580
Butterfat	.445*	.467*	.500	.530

*These values were obtained by extrapolation (calculated from the known sp. heat in milk) on the assumption that the specific heat is about the same in the solid as in the liquid state.

Specific Ophthalmia—See Diseases in Cattle.

Spectrograph—An instrument for photographing or mapping a spectrum.

Spectrometer—An instrument designed to break up the light from a source into its constituent wave lengths and to provide a means of qualitative or quantitative study of the spectrum thus formed. The basic parts of the instrument are: (1) the slit, (2) the lenses, (3) the dispersing system, and (4) the observing or recording system.

Spelt—See Feeds and Feeding.

Sperm-Spermatozoon (pl. Spermatozoa)—The male, motile, sexual cell of the semen whose function is the fertilization of the female egg cell.

Spermatogenesis—The formation of spermatozoa. See Spermatozoon.

Spermatozoon—A fertilized egg.

Spermkäse Cheese—See Cheese.

Sphincter Muscles—Muscles at the upper and lower end of the teat canal. The muscle at the lower end keeps the milk from flowing from the udder until it is relaxed by sucking or milking. The sphincter muscle at the upper end of the teat canal is also a gripping muscle, and is located at the base of the milk cistern. The cow has no conscious control over either of these muscles.

Sphingomyelins—A class of phospholipides, each molecule of which consists of one molecule of sphingosine esterified with one molecule of fatty acid, one molecule of phosphoric acid and one molecule of choline. They have a ratio of nitrogen to phosphorus of two. Sphingomyelins occur in small amounts in milk.

Sphingosine—A long chain (18 carbon atoms) amino alcohol forming a constituent of sphingomyelins and cerebroside.

Spices—See Ice Cream.

Spikelets—Cluster of one or more flowers on a plant.

Spinning (cheese)—See Cheese.

Spirilla—Curved rod like forms of bacteria.

Spitz Cheese—Spitzkäse—See Cheese.

Sponging Process of Ventilation—A method for removing moisture from air in curing and storage rooms. The main fea-

ture of the system is drawing in fresh air from the outside, allowing it to become saturated with moisture, and then expelling it through another outlet.

Spongy—See Cheese Defects (Body-Check).

Spoon Test—See Dairy Tests

Spore—A minute, semicellular reproductive body of microscopic size produced by plants and some protozoans, and sometimes motile by means of flagella.

In bacteria it is a concentration of the bacterial cell contents into a thick-walled structure when the organism is in the presence of inimical substances, when essential foods are absent, or under unsuitable physical conditions. This spore is very resistant to desiccation and heat. It makes possible the preservation of the bacterial life under circumstances which ordinarily would mean destruction. This phenomenon has practical significance particularly in relation to pasteurization.

Sport—An individual organism which differs from its parents beyond the usual limits of individual variation. A mutation.

Sporulation—Spore formation

Spotted Bur Clover—See Feeds and Feeding.

Spray—An application of a fungicide or insecticide or a combination of the two in solution. Also, the material so applied with a sprayer mechanism used for this purpose. This may have a spray-gun attachment which delivers the liquid evenly and finely.

Spray Ball—A perforated stainless steel ball which is attached on the end of a line inside a tank or vat and through which a cleaning solution is forced, "spraying" and cleaning the inside of the tank or vat to eliminate manual washing of tank interiors.

Spray Condenser—**Spray-Drying System**—**Spray Pasteurizer**—**Spray Vat**—See Milk, Processing and Processing Equipment.

Spread—As regards milk prices, the difference in the price the distributor pays the farmer for milk and what he charges the consumer.

Spreader (insecticides)—Any substance, as soap, oil emulsion, casein, etc. added to

fungicides and insecticides to increase their spreading on foliage by lowering the surface tension

Bact—A spreading colony usually found on an agar plate. A spreader usually originates from air contamination while melted agar is being poured into a petri dish during routine milk analysis for bacteria count

Spring Crops—Oats, rye and wheat planted in the spring and harvested in the summer

Springer—A cow in calf, i.e. due to calve soon

Springhalt (Stringhalt)—A lameness in the horse due to muscular spasms in the hind legs, causing excessive flexure in locomotion and hindering action. It can best be discerned when a horse backs out of a single stall after being idle for some time

Square Cheese—**Square Prints**—See **Cheese**

Stab—Abbreviation for stabilizer

Stabbing—See **Cheese**

Stab Cultures of Bacteria—These are made by passing a fine wire, which has been dipped in a material containing the bacteria to be examined, into a tube of agar or gelatin medium in which the bacteria will grow.

Stabilized Homogenized Butter Spread—See **Butter, Whipped**

Stabilizer—A protective colloid used to make a stable emulsion with two immiscible liquids.

As applied to the dairy industry, a substance such as gelatin used to give stability or firmness to dairy products. Stabilizers are used (1) to prevent the breaking up, as it were, of the ingredients of an ice cream mix when frozen, (2) to help prevent churning of the fat during the freezing operation, (3) to give a certain amount of firmness and smoothness and thereby preventing excessive crystallization, (4) in processed cheese, salt stabilizers are used for the prevention of fat separation, (5) in evaporated milk or ultra cream they are used to prevent feathering.

Common stabilizers used in chocolate milk and ice cream are gelatin and sodium alginate (Kalkoid), salt or mineral stabilizers are usually citrate and phosphate. See **Kalkoid** (modified Irish Moss). They

help make finished products smooth. For evaporated milk, disodium phosphate stabilizer is permissible for commercial practice to control the heat stability. Federal Standards of identity permit limited use, to obtain uniformity and maximum viscosity.

See **Cheese** for stabilizers used in cheese making

Stable—A house, shed or building for cattle to lodge and feed in, especially a building which has stalls, as for cows

Stable Flavor—See **Milk and Cream Defects**

Stable Fly (Stomoxys calcitrans)—This fly resembles the ordinary house fly in appearance but is able to pierce the skin and suck the blood of animals and therefore is a great nuisance to farm animals. The eggs of the fly are laid mostly in wet, decaying vegetation and it takes about 15 days for them to develop to adult flies. Screens, fly repellents, and proper sanitation will help control this pest.

Stables, How to Darken—Stables may be darkened by covering the windows with shades and keeping the shades drawn when the sun is shining brightly, or by applying to the window panes a bluish colored substance similar to whitewash.

Stag—An unsexed male animal, castrated when mature or so far advanced toward maturity that masculinity is rather evident in the forequarters. **Staggy**—Having the appearance of a mature male animal said of certain female domestic animals.

Stagger—To plant alternately on each side of a median line. To arrange work and working hours so that employees are on the job in shifts or at alternating hours or intervals.

Staggers—See **Diseases in Cattle**

Stain—A dye, pigment or the like, absorbed by the pores of wood instead of forming a coating as does paint. Stains of various kinds are also used in identifying bacteria.

Stainless Steel (Allegany Metal)—A metal containing approximately 17 to 20% chromium, 8 to 15% nickel, and 69 to 74% iron. It is durable and easily kept in good condition. Generally, dairy authorities recommend stainless steel whenever possible for equipment coming in contact

with milk because it seems to be the most satisfactory in that it does not seem to affect the flavor of dairy products. Also known as Ascoloy, Superascoloy and Enduro.

Stains for Microscopic Count of Bacteria—Any dye, reagent or other material used in coloring tissues or organisms for microscopical study. Bacteria may be seen more clearly if they are stained. One of the most popular methods used for this purpose is the Gram Method, because it is especially useful in the identification of bacteria of importance in the dairy industry. Microorganisms after treatment with gentian violet are stained a violet black by applying solution of iodine in potassium iodide. Stains are retained more or less completely on treatment with absolute alcohol. Bacteria which retain the stain are known as Gram-positive. Most true lactic bacteria and yeasts and molds are Gram-positive. Those that lose the stain are Gram-negative. Most harmful bacteria are Gram-negative. The Gram method lends itself well to the examination for lactic acid cultures and sour milk preparations in general as the casein is completely Gram-negative.

For details regarding bacterial analysis see book on "Standard Methods for Examination of Dairy Products."

Stalagmometer—Traube's apparatus for determining the surface tension of liquids by the weight of drops. It consists of three accurately calibrated glass tubes; one for small quantities of thin liquids, one for large quantities of thin liquids, and one especially designed for blood and other viscous solutions. It is used in certain experimental work on milk and milk products.

Stale Flavor—See Butter and Ice Cream Defects. Lack of freshness; vapid or tasteless or other change in flavor due to age and unfavorable storage temperature especially in food products.

Stall—The compartment or division of a stable for one horse, cow or the like. There are two types, tie and stanchion.

Stall Barns—Barns arranged for one or two rows of stalls and with such maternity pens and feed rooms as are needed. They have long been accepted and undoubtedly many situations justify them. However, fewer of these barns are likely to be built in the future as loose housing be-

comes more popular. New barns, where conditions are suitable, should be of the one story type, properly insulated, adequately ventilated, and equipped with all sanitary and labor saving devices.

Stall, Stanchion—A stall equipped with a stanchion for fastening the cow in place. It is a device for holding or fastening the cow in, consisting of two upright bars and two movable horizontal bars. It is usually made of metal but often has wooden liners next to the cow's neck. The animal's head is thrust through the frame and the movable bars are adjusted so that it cannot withdraw its head, but permits a lateral swinging motion. The stall should be constructed and the stanchions arranged to give the cow the greatest possible freedom, and should be of a size to give the cow comfort and to keep her clean.

Stalls, Tie—A tie stall is one in which the cow is fastened by means of rings fitted loosely on the arched pipes and connected to a chain which snaps to the neck strap of the cow. The arches should be from 10 to 12 inches apart which will prevent the cow from moving too far forward in her stall. This permits a little more freedom than does the stanchion stall.

Stamen—The male organ of a flower, bearing anthers which produce the pollen.

Stanchion Hose—The rubber hose connecting the milking machine with the air line system of this equipment.

Standard Bushel—See Bushel.

Standard Hood Seal—The standard hood seal for milk and cream bottles consists of a sterile paper hood which completely covers the whole top of the bottle, extending well down on the sides, and locked by a metal ring or other device. There are now many other approved types of caps that entirely cover pouring lip of the bottle.

Standard Methods—Approved bacteriological and chemical methods for the analysis of milk, published by the American Public Health Association.

Standard Strength Vanilla Extract or Standard Vanilla Extract—Commercial vanilla extract prepared according to U.S. government standards which specify that each 100 cc. of extract must contain the

soluble matter from 10 gms of vanilla beans It takes 13.34 oz of vanilla beans to make 1 gal of this extract

Standardization of Milk and Cream—The mixing together of milk and cream varying in composition in such amounts as to secure milk or cream of a desired composition Milk and cream are usually standardized on the basis of percentage of fat See Pearson Square Method and Milk Standardization of

Standardization of the Microscope—A term used in connection with the Breed method of counting bacteria in milk It is the adjustment of the microscope by the use of a stage micrometer in such a way that each field of the microscope covers a certain known fraction of the total square centimeters area

Standards—Cheese and Cheese Products—See Cheese

"Stand by" Surplus Milk—See Surplus Necessary

Standing Crop—A grain crop mature but not harvested

Staphylococci—Round forms of bacteria occurring usually in clusters like bunches of grapes, sometimes singly or in pairs They are Gram positive and produce an orange to white pigment They are usually parasitic on the skin and mucus membranes *S aureus* producing a yellow brown pigment causes acute suppurative, —boils, abscesses, etc., is the most common of these organisms *Salbus* is similar but produces a white pigment When milk becomes infected with these organisms a severe type of food poisoning may result from the toxins they produce See Hand book article Food Poisoning" P 91

Staphylococcus Poisoning—Custards, creamos (particularly synthetic creams), and milk to some extent are causes of staphylococcus poisoning Some cows suffer from a type of staphylococcal mastitis and milk from them may contain millions of these organisms. However only a few of these are poisonous. Really the principle source of cream or milk infection is from the hands of workers who may have infected sores or lesions. These germs do not grow in a medium held at a low temperature. Only when the temperature is somewhat above 70° do they grow fast enough to develop their toxin (poison). The toxin is

very heat resistant and smell and taste are of little value in detecting its presence

Starched Circle—See Cheese

Starter—Startoline—See Butter Starter, Mother Starter and Bulk Starter

Starter, Activity Test for—See Dairy Tests

Starter Can—A tank with insulated water jacket and agitator suitable for the preparation of large batches of starter

Starter Rotation—The process of using a different strain or kind of lactic acid producer on succeeding days Bacteriophage is fairly specific for a strain of bacteria, but it takes some time for the phage to build up to such a level as to prevent acid production completely If however a different strain of bacteria is used on succeeding days the phage is not liable to be built up to acid stoppage levels

Stassanising—See Milk Processing and Processing Equipment

State Brand Cheese—See Cheese

State Farmer—A degree in the Future Farmers of America organization awarded when certain minimum qualifications have been met It is awarded on meritorious achievement in the state organization Each state has special names for this degree

Steam—Water in the state of vapor There are three forms in which steam may be found depending on the amount of heat and moisture it contains First, *dry steam*, which is steam formed when water is vaporized and contains no droplets of water Second, *wet steam* a mixture of dry, saturated steam and water Third *superheated steam* is saturated steam which has been heated at constant pressure so that its temperature is higher than that of the saturated steam at the same pressure. Its temperature depends upon the amount of heat which has been added.

Steam is the most popular source of heat for general use in the dairy plants chiefly because it is economical and flexible and its other properties which adapt so easily for conveying large quantities of heat from the heat source to the product which is to be processed

Steam Boiler—An enclosed vessel arranged for the generation and storage of steam

for use in heating or in the production of power. Generally, the term "boiler" is applied to the combination of the furnace in which fuel is burned and heat liberated, and the enclosed vessel in which steam is formed by the absorption of heat liberated in the furnace.

Steam Cabinet—A sterilizing device consisting of an oven or chamber of brick, metal, concrete or wood in which are placed various pieces of dairy equipment prior to sterilization by the introduction of live steam for a period of from 20 to 30 minutes.

Steam Jet—A steam pipe used in sterilizing milk cans. The pipe extends from a boiler through a drain board, the release of steam being regulated by a hand or foot lever. After washing, cans are inverted over the outlet and steamed. This method is not as satisfactory as the steam cabinet method of sterilization.

Steapsin—See Cheese.

Stearic Acid— $C_{18}H_{36}COOH$. A non-volatile, saturated fatty acid present in butter fat to the extent of 7-12%.

Stearin—A milk fat forming about 1.8% of butterfat. It is a combination of glycerol and stearic acid.

Steel—A hard compound of iron, carbon being the principal substance added. Steel is readily oxidized by milk, air, water, acid, salt and brine, and therefore its use in the dairy industry cannot be recommended except in small equipment such as pails. Even there it should be coated with tin.

Steelyard—A form of balance in which the body to be weighed is suspended from the shorter arm of a lever which turns on a fulcrum, and a counterpoise is caused to slide upon the longer arm to produce equilibrium, its place on this arm, which is notched or graduated, indicating the weight.

Steenbock Unit—The total amount of vitamin D which, when fed over a 10-day period, will produce a narrow continuous line of healing (2+line) in the bones of vitamin D deficient animals. Sixty per cent of the animals must give a 2+line of healing in order to say that the material fed to each contains one Steenbock unit.

Steer—Unsexed male (cattle), castrated when a calf. The best age to castrate calves is 4-8 months. The longer it is delayed, the greater is the risk of loss from the operation, and the greater the liability of coarseness developing in head, neck, and forequarters.

Steinbuscher—See Cheese.

Steinecker Cheesemaking Machine—See Cheese.

Stoppes Cheese—See Cheese.

Sterile—As applied to bacteriology, free from all living organisms.

As applied to animal husbandry, unable to reproduce.

Unproductive, yielding little or no crop.

Sterility—Inability to produce normal living young.

Sterility Tests for Dairy or Laboratory Equipment—Use of swab and rinse techniques to indicate numbers of microorganisms on the surface of equipment.

Maximum number of microorganisms, obtained by the plate count, have been assigned to specific types of dairy equipment.

Sterilization—In bacteriology, the destruction of all microorganisms in the preparation of laboratory apparatus, in the production of culture media, and in discarded cultures, specimens, etc. These organisms are destroyed by heat, either dry or moist, ultrafiltration, or chemical action including that of fumigants. In the dairy industry, sterilization as applied to equipment, etc., is a process which destroys for all practical purposes most of the microorganisms. Sterilization of milk is a term usually used in connection with evaporated milk. Sterilization of milk in its original form is a process distinct from pasteurization in that milk is heated rapidly to very high temperatures to destroy all life. This is not practiced to any appreciable extent in the U.S., although it was making headway in Europe before the war.

Sterilized Milk—See Milk.

Sterols—A class of naturally occurring solid alcohols all of which contain the cyclopentano-phenanthrene nucleus. Certain of the sterols are precursors of Vitamin D, the latter being formed by ultraviolet irradiation.

Sterren Tablets—The trade name of rennet tablets each of which is equivalent to one ounce of rennet

Stewart-Slack Test—See Dairy Tests

Sticker—Any material for increasing the adhesive qualities of an insecticide or fungicide, used especially where foliage is waxy Milk is often used

Sucky Churn—See Butter

Sucky Texture—See Butter and Ice Cream Defects

Stuff Corky Texture—See Ice Cream Defects

Stillage—See Feeds and Feeding

Still Air Hardening Room—A type of ice cream hardening room in which the expansion coils of the refrigerating systems are arranged to constitute shelves on which the ice cream containers are to be placed. The feature of this system is the bringing of the product to be frozen in close proximity to the source of cold. No special provision is made for air circulation

Stillbirth—The birth of a dead fetus, usually well advanced in development as opposed to the narrow use of abortion

Stilton Cheese—See Cheese

Stinker—See Cheese Defects (Swiss)

Stirk—A young bull or heifer in the second year

Stirred Curd Cheese—Stirred Curd Method—Stirring Out—See Cheese

St. John's Bread—See Feeds and Feeding

Stock—(Livestock) A group of genetically, closely related individuals in a breed or species.

Stockbreeder—One who is engaged in the breeding, rearing and caring for livestock, either for the market or for show purposes.

Stockcar—A latticed railroad boxcar or truck for carrying livestock.

Stocker Cattle—Stockers are young animals so fed and handled that growth and good condition are the main objectives. They may be either steers or heifers intended for fattening purposes at a later period. Ordinarily such cattle are held only about a

year. They are chiefly fed on pasture and cheap roughage. This type of operation is usually carried on in the range states, but also to some extent on farms where land is not too valuable. Also cattle, other than beef or steers over three years of age.

Stock Farm—A farm chiefly devoted to the rearing of livestock, especially beef cattle, horses, sheep and hogs.

Stock Feeder—One who feeds livestock, especially, one who buys stock and rapidly fattens it for market.

Stockjudging—The judging of livestock, as in competition or for educational purposes either for the relative conformity of the animal to the established breed characteristics or for performance.

Stockyard—A yard for keeping livestock, specifically, an enclosure with stables, pens, sheds, etc. usually connected with a rail road, where cattle, swine, sheep, and horses are kept temporarily for slaughter, market, or shipping.

Stolon—An aboveground trailing branch that roots wherever it strikes the soil. A means of vegetative multiplication.

Stomach—A dilated, more or less saclike organ into which the esophagus or gullet empties and in which the earlier stages of digestion, by gastric juices, take place.

Stomachics—Drugs and other agents used to tone and stimulate the stomach. Used in connection with certain digestive disturbances in cattle.

Stone Cheese—See Cheese

Stone Bruise—A sore spot on the bottom of the foot without laceration due to a bruise by a stone or rounded object.

Stooling—See Tillering

Storage Cheese—See Cheese

Storage (Ice Cream)—See Ice Cream

Storage Flavor—See Butter and Milk and Cream Defects

Storage Tank—(Storage Vat), Milk—A large tank or vat, usually insulated, used for the storage of milk after it has been received at the plant and before it is pasteurized. These tanks are often constructed with a refracted outer jacket and are

installed either vertically or horizontally. In such case they are termed cold-wall tanks.

Storch Test—See Dairy Tests.

Stover—See Corn Stover

Stracchino Cheese—See Cheese.

Straight Commission Buying—A method for purchase of cream by creamery operators. An employee or agent of the creamery solicits the farmers' cream and pays them in cash or by company check. The price paid is dictated by the creamery company which also assumes responsibility for fat shortages between the cream station and the central creamery. The agent may receive a weekly wage or his compensation may be on a commission basis. The equipment and rental of the cream station is usually provided by the company.

Straightedge—A bar or slip of wood or metal, a board or the like, having one or more long edges made straight, used for testing straight lines and surfaces, drawing straight lines, etc.

Strain—In genetics, a rather loose term applied to a group of individuals within a breed and differing in one or more characters from the other members of the breed; for example, the Milking Shorthorns or Polled Herefords.

In plants, a subdivision of plants within a variety exhibiting important inherited traits and differing from other plants of the same variety.

Strainer—A utensil made of fine mesh, usually of stainless metal, but also may be cotton pads or cloth, set in a suitable frame. Milk is poured through the strainer for the purpose of removing particles of dirt, hair or other sediment. This straining operation is carried out by the producer shortly after the milk has been taken from the cow.

Colby Strainer—See Cheese.

Strainer Test for Mastitis—A test for clinical and subclinical mastitis (udder infection). It consists in allowing a little of the foremilk of the cow to pass through a strainer which may consist of a black cloth or a fine wire gauze. If mastitis is present, typical mastitis flakes may be observed on the dark cloth or on the wire gauze. A strip cup is more sanitary and more satisfactory if one is available.

Strängenläse—See Cheese.

Straw—Residue, chaff and stalks of grain after threshing, used as bedding for livestock, for packing or for fodder.

Streak Canal—See Teat Canal.

Streptococci—A genus of bacteria which are spherical in shape and occur typically in large, wavy chains but may occur in pairs—seldom singly. Division of individuals is along one plane. They may be either aerobic or anaerobic—are Gram-positive. There are a number of types, some of them produce serious diseases in man and animals—others are useful in the dairy industry as in the making of starters and ripening of some types of cheese.

Strep. Agalactiae—A long chain udder streptococcus which has been shown to be associated with about 80% of the cases of mastitis in dairy cows, thus causing a serious economic problem to the dairy industry.

Strep. Citroverus—An associative organism normally present in butter cultures or starter. It produces volatile acid from the citric acid normally present in milk and from the lactic acid formed by *S. lactis*. It differs from *S. paracitroverus* in that it does not form lactic acid and is not so widely distributed in dairy products.

Strep. Cremoris—A gram positive streptococcus found in raw milk and milk products. Used in commercial starters in butter and cheese production. Does not grow well on artificial media.

Strep. Durans—A salt-tolerant acid producing organism, often found in milk powder. A member of the fecal streptococci.

Strep. Faecalis—An organism which has been used as an acid-former in Cheddar cheese. This culture has been known as a D.K. starter after Dahlberg and Koslowski.

Also found in the intestines and is the type species of the group of fecal streptococci.

Strep. Lactis Group—A group of microorganisms important in the dairy industry. *Streptococcus lactis* is the type species of this group, which are characterized chiefly by their production of lactic acid in dairy products, without the digestion of curd or the formation of gas. The indica-

for litmus is reduced rapidly and completely. A description of some of the members of this group follows. *S. lactis var. maltigenes*. Characterized by the production of a malty or caramel flavor in milk, cream, etc.

S. lactis var. hollandicus. Produces aropy or slimy condition.

S. lactis var. anoxyphilus. Reduces litmus slowly, coagulation setting in before reduction is complete.

S. lactis var. tardus. Coagulates milk very slowly.

These organisms are gram positive and nonmotile.

Strept. Liquefaciens.—A typical acid forming organism commonly found in dairy products. It coagulates milk rapidly and in addition actively proteolyzes or dissolves the protein. It is gram positive and is capable of producing large amounts of acetyl methylcarbinol in milk. In certain instances the organism has been responsible for bitterness in pasteurized products, such as milk, cream and brick cheese. In milk, these organisms are arranged singly, in pairs, and in short chains.

Strept. Paracitrovorus.—An associate organism normally present in butter cultures or starters, producing volatile acid from the citric acid normally present in milk and probably also from the lactic acid which it is capable of producing in small amounts. Easily isolated from sour milk or cream. It differs from *S. citrovorus* in that it does produce some lactic acid in milk, while *S. citrovorus* does not.

Strept. Thermophilus.—Produces lactic acid which assists in checking the development of undesirable fermentation and acids in the ripening of the cheese. It is desirable for Swiss cheese.

Streptomycin.—See Antibiotics.

Stress.—Internal force in a material which results in the destructive action of external force. These are tensile stresses, compressive stresses, and shearing stresses. The stress per unit area, as for example pounds per square inch, is called the unit stress. Unit tensile stress is equal to the force applied divided by cross-section area of the material. Strain is the resulting deformation.

Stretch (in cheesemaking).—See Cheese.

Stretchable Wrapper (stretchable film).—See Cheese.

Striking (in Condensed Milk).—The process of drawing a sample of condensed milk from the vacuum pan and testing for density.

Stringer Cheese.—See Cheese.

Stringy Milk.—See Milk and Cream Defects.

Strip.—To milk dry, to strip a cow. By very persistent milking and manipulation of udder until all or nearly all milk has been secured. Two reasons used to be given: 1st, it gets richest milk; 2nd, it encourages cow to give more milk.

To remove seed or grain from grass by force or picking as with a comb-like implement.

Stripcoating.—See Cheese.

Strip Cropping.—**Strip Farming**.—The growing of several different crops in alternate bands usually as an effective means of conserving soil and water, on a field laid out in narrow strips, usually with the contour of the land.

Strip Cup Test for Mastitis.—A test for the detection of mastitis involving the use of a strip cup holding one-half to one pint of milk and containing a fine mesh screen as a false bottom. Sometimes a black cloth is placed under the screen to provide a sharper contrast of background. As the stream of milk from each quarter of the udder is milked directly into the cup and passes through the sieve, any clots or flakes or other gargety condition of the milk is readily noticeable, and the infected udder or quarter can be detected.

Strip or Rationed Grazing.—An intensive method of grazing. An area is marked off daily by means of a movable fence to provide just enough grazing for one day's feed. The animals do not graze more than one day on any one strip.

Strippings.—The last milk of a milking. It is much higher in fat per cent than the foremilk or middle milk. It may test as much as 8% fat.

Stubble.—The stumps of wheat, corn, etc., left in the ground, as after harvesting.

Stubble Mulch Farming.—The type of farming practice in which crop residues

are left on the surface of the soil instead of being incorporated into the topsoil

Stunted—Arrested in growth or development; dwarfed; as a calf or a plant.

Styria Cheese—See Cheese.

Subacid Soils—Moderately acid or sour; as having a hydrogen concentration of 5.5-6.0; said of certain slightly acid leaf-mold soils.

Subclinical Mastitis—See Diseases in Cattle

Subcutaneous—Beneath the skin; as, subcutaneous injections with hypodermic needle.

Subcutaneous Test—A method of applying the tuberculin test to dairy cattle. The test is made by injecting the proper quantity of tuberculin underneath the skin into the subcutaneous tissue. If an animal is tubercular, the action of the tuberculin will cause a rise in temperature. The animal's temperature should be taken at least 3 times before the injection at 2-hour intervals and at 2-hour intervals after injection until the test is completed. This test should be performed only by qualified persons. No longer in common usage.

Sublimation—1. The process of vaporizing a solid substance by heat and then condensing it; a process of purification by separating the non-vaporizable impurities, a process analogous to the distillation of liquids.

2. Freud's term for the diversion of certain components of the sexual instinct to a higher and non-sexual aim

Submicrons—Particles visible in the ultra-microscope but not visible in the ordinary microscope.

Subsoil—The part of the soil underlying the plow depth.

Substrate—A base as of a pigment. A substance acted upon, as by an enzyme. The inorganic materials in hard water acted upon by water softeners to make the water soft.

Subterranean Clover—See Feeds and Feeding.

Sucaryl—A proprietary non-calorie sweetener in solution or tablet form for use in place of sugar in low-calorie and sugar

restricted diets. Used in ice cream formulas for diabetics.

Composition: Cyclamate sodium 6.00%
Saccharin sodium 0.6 %
Benzoic acid 0.1 %
Methyl paraben 0.05%

Succession of Crops—Continued seasonal production of a certain crop either by repeated sowings or by selecting varieties maturing at different times. The culture of two or more short-life crops planted in turn

Succulent—A plant full of juice; having juicy or watery tissue. See Succulent Feed in Feeds and Feeding.

Suckle—Suckling—To nurse at the udder. A young animal before it is weaned; a suckling calf

Suckler—A mammal; an animal that suckles its young

"Suonski"—Abbreviation for sweetened condensed skim milk.

Sucrase—One of the enzymes of the intestinal juice secreted in the mucus membrane of the intestines which reduces the complex sucrose sugars into simple sugars. Sucrase breaks sucrose down into one molecule of glucose and one molecule of levulose

Sucrose—($C_{12}H_{22}O_{11}$) A disaccharide composed of glucose and fructose. Very soluble and easily hydrolyzed. Cane and beet sugar are composed of sucrose. See Ice Cream.

Suction Pressure in Refrigeration—See Back Pressure or Low Pressure.

Suction Pump—The common pump, in which the liquid to be raised is pushed by atmospheric pressure into the partial vacuum under the retreating bucket on the upstroke, reflux being prevented by a suction valve in the pipe. Theoretically the suction pump will lift water about 34 feet, but practically, only a little over 20 feet can be counted on, because of leakage and other losses.

Sudan Grass—See Feeds and Feeding.

Suet—The fat about the kidneys and loins in beef and mutton, which, when melted, forms tallow.

Sulect—A general term sometimes used by ice cream makers to indicate the sweetening effect of all added sugars regardless of

source, expressed as the weight of sucrose necessary to give an equivalent sweet taste.

Sugar—The common sweetening agent. Any of a class of sweet substances belonging to the carbohydrates and regarded as ketonic or aldehyde derivatives of the higher alcohols. More commonly the term sugar is used to indicate sucrose.

Beet Sugar— $C_{12}H_{22}O_{11}$ (Common White Sugar). Obtained from the refining of sugar beets. Chemically it is sucrose and is identical with cane sugar. Price is usually slightly lower than for cane sugar.

Brown Sugar and Maple Sugar—These sugars are sucrose sugars but they both contain characteristic flavoring material which limit their use in ice cream making.

Cane Sugar—Common white or refined sugar obtained from the sugar cane. Same as sucrose. It is used for general sweetening purposes. This sugar is found in almost all plants in greater or lesser amounts. When obtained from beets, it is known as beet sugar and it occurs in the same form as in the sugar cane. It is a crystalline solid, forming monoclinic prisms; it is easily soluble in water and slightly so in alcohol. It melts at $160^{\circ}C.$, ($320^{\circ}F.$). When melted and allowed to cool, it forms a transparent, vitreous-like mass known as barley sugar, which gradually becomes crystalline. This disaccharide has the chemical formula $C_{12}H_{22}O_{11}$ (common white sugar). One of the sugars commonly used as the sweetening agent in ice cream, sweetened milk drinks, etc.

Sugar Beets—**Sugar Cane**—**Sugar Cane Bagasse**—**Sugar Cane Pulp**—See Feeds and Feeding.

Sugar Syrup Concentration, How to Make and Calculate—See Reference Section, P. 295.

Sugar Well—See Milk, Processing & Processing Equipment.

Sulfamic Acid— NH_2SO_3H , a crystalline inorganic compound, an amino derivative of sulfuric acid which is apt to cause corrosion on tinned steel or stainless steel.

Sulfate— SO_4 . A salt of sulfuric acid. Milk contains approximately 0.10 gm. of sulfate ions per liter.

Sulfate of Ammonia—See Ammonium Sulfate.

Sulfates—As constituents in washing powder they are occasionally added but they have no desirable qualities.

Sulfuric Acid— H_2SO_4 . A colorless, odorless, non-fuming liquid, soluble in water. Commercial concentrated sulfuric acid, known as oil of vitriol, has a specific gravity of 1.82-1.84 and is used as the reagent in the Bahcock test.

Sulfur Trioxide— SO_3 . A white crystalline solid formed by passing sulfur dioxide with oxygen over red-hot, finely divided platinum. It readily unites with water, forming sulfuric acid (H_2SO_4). It is present in milk to the extent of .027% by volume of the milk.

Summer Complaint—See Infantile Diarrhea.

Summerfallow—A practice carried on in dry-land farming wherein land is cultivated during the summer, not planted but kept weed-free until the following spring when it is planted, the idea being to utilize as much as possible two-season's rainfall for the growth of a crop and also to accumulate and conserve soil nitrogen.

Sundaes and Specials—See Ice Cream.

Sunflower—**Sunflower Seed Oil Cake**—**Sunflower Silage**—See Feeds and Feeding.

Sunlight, Effects of, in the Dairy Industry—Sunlight in the dairy industry is important for the formation of vitamin D by the irradiation of sterols in the tissues of dairy cattle. It destroys vitamin C in exposed bottled milk and to some extent is responsible for undesirable flavor in milk exposed to it. To some extent it kills bacteria when unprotected by organic matter. For effect on flavor of milk and cream see Milk and Cream Defects.

Superalkaline—Having a pfl value of 10.0 = 10.5%, said of the most highly alkaline suits known, those of certain deserts.

Supercalcoloy—See Stainless Steel.

Supercooling—The cooling of a liquid below its true freezing point while it still retains its liquid form. When freezing finally does take place, it is accompanied by a rising temperature until the true freezing point is reached. The tendency to undergo supercooling may be limited or prevented by (1) the presence of crystals which separate on freezing, (2) presence of suspended particles, and (3) agitation.

Superfecundation—Successive fertilization of two or more ova from the same ovula-

tion. Customarily occurring in litter-bearing animals.

Superfotation in Animals—Conception during a pregnancy (3 to 9 weeks after first conception). In such a case the female will be carrying two fetuses or litters of different ages, at the same time. Sometimes both sets are born at the end of the regular gestation period for each set. Sometimes both sets are born at the time that is normal for the older set. When this happens the immature set rarely lives.

In plants the fertilization of an ovule by two or several kinds of pollen.

Superheated Condensed Milk (Whole or Skim)—See Milk, Processing and Processing Equipment.

Superheated Steam—Heated, dry, saturated steam. Steam which is heated to a temperature above that of saturated steam at its corresponding pressure. The properties of superheated steam approximate closely those of a perfect gas and for all practical purposes may be considered as such, at low pressures.

Superheater—Superheating—See Milk, Processing and Processing Equipment.

Superintendent of Official Testing—A state official authorized to appoint and supervise men who test dairy cattle, and to make rules to govern the conduct of the test. Most states, however, use the standard rules prepared by the American Dairy Science Association.

Supernatant—A substance which floats on another substance, as fat on water.

Supernumeraries—After teats, abortive teats, or extra teats. A condition of dairy cows characterized by the presence of more than four teats on their udders. Some of these small, extra teats are the orifices of small glands. This condition is referred to as polythelia. See Caudal, Intercalary, and Ramal Supernumeraries.

Superovulation in cows—The secretion by the ovaries of many ova (eggs) during one heat period instead of a single egg. Experimentally—transplantation of fertilized egg from one cow to another has been accomplished. Whether this practice will in the future have significant economic value as has the practice of artificial insemination has yet to be proved. See Ovum Transplantation.

Superoxidase—Same as Catalase.

Superphosphate—Mono-calcium phosphate, $\text{CaH}_2(\text{PO}_4)_2$. A type of phosphate fertilizer prepared by treating rock phosphate with sulfuric acid. It contains from 15 to 50% available phosphoric acid.

Supplement—To fill up or supply by additions; Ex. a protein supplement to home grown grains in dairy cattle and poultry feeding.

Supply—In marketing, the quantity of a commodity, which will be sold, or offered for sale, at a particular price.

The total quantity of any commodity in existence.

Suppression of Milk—See Diseases in Cattle.

Suppurating Body Wounds—Open sores on a cow's body which become filled with matter or pus. This condition is detrimental to the production of wholesome milk.

Suppuration—Pus formation.

Supreme Cream—See Milk and Cream.

Surati, Panir—See Cheese.

Surface-Active—A soluble agent capable of depressing the surface tension of a liquid.

Surface Condenser—**Surface Cooler**—See Milk, Processing & Processing Equipment.

Surface Ripened—See Cheese.

Surface Soil—The upper surface or plow layer of top soil; usually darker in color, richer in plant nutrients and humus than the lower sub-soil.

Surface Taint—See Butter Defects.

Surface Tension—Two fluids in contact exhibit phenomena due to molecular attractions which appear to arise from a tension in the surface of separation. It may be expressed as dynes per cm, or as ergs per square centimeter.

Surfactant—Surface active agents or wetting compounds which lower the surface tension of the water used for cleaning by breaking the lines of force and thus improve its wetting power. The cleaning agent of which they are a part therefore more readily penetrates the inter-surface between the surface and the soil upon it.

Surfeit—See Diseases In Cattle.

Surplus Milk—Milk which is not sold as market milk for direct consumption but is sold, usually at a lower price, to be manufactured into cream, butter, buttermilk, cottage cheese, etc.

Surplus Milk, Constant—Excess milk produced in a milkshed at all times and made available for fluid milk if the regular supply is reduced or if consumer demands unexpectedly increase. While it is desirable to have some surplus, a constant supply in excess of needs indicates a milkshed larger than necessary.

Surplus Milk, Necessary—A surplus of milk which dealers carry to ensure a sufficient supply of fluid milk to take care of fluctuating demands from day to day. The amount of this variation is usually from 10 to 20% of the total fluid amount handled by the dealer. Also known as "stand by" surplus.

Surplus Milk, Seasonal—An increase in milk production during the spring and summer because of more favorable feed conditions and breeding program.

Survival Rate—Factor sometimes used with frozen semen to designate the per cent of those sperm which "revived" after freezing and still survive after a stated period of incubation or storage under refrigeration.

Suspension—A system which consists of finely divided solids dispersed in a liquid: ex. Milk has its solids partly in solution and partly in suspension.

The action which holds up insoluble particles in a solution. This action prevents the settling of solids which might form deposits. It also makes it easy to flush the insoluble particles from the equipment.

"Suspension Starch"—A special preparation mixed with cocoa, sugar and other ingredients for making a chocolate milk drink with cornstarch as stabilizer. It increases the viscosity of milk and prevents the cocoa particles from settling in the bottle.

Suspensoid—A hydrophobic colloid in which the particles show so little attraction or affinity for water that they show a great sensitivity to the action of electrolytes. They differ in this respect from an emulsion which has greater stability. An example of a suspensoid in milk is the colloidal state of some of the calcium

phosphate which precipitates out upon the addition of mineral salts.

Sveciaost—See Cheese.

Swab Method—A method for determining the sterility of large dairy equipment such as vats and pasteurizers. The swab consists of a small sterilized wad of cotton fastened on the end of a wooden or metal handle. The swab is dipped into a 100 ml. sterile water blank; a definite area, such as 1 sq. ft. of the vat, is rubbed with the swab and the bacteria then are removed by rinsing the swab in the water blank. A plate count is taken to find the number of bacteria per square foot, or other area. Assuming that the surface swabbed is representative of the entire vat, the approximate amount of contamination of milk may be determined.

Sward—The grassy surface of land; that part of the soil which is filled with the roots of grass; turf. A term common in England.

Swath—A windrow of cut grass or grain as left by a scythe or mowing machine.

Swather—A combine attachment for cutting and laying green crops in swaths, each 12 to 24 feet wide.

Swede (Sugar Beets)—See Feeds and Feeding.

Sweepstake Prize—A prize awarded to a specimen or group of specimens winning highest honors in either a variety, breed, class, or combination of classes.

Sweet—For dairy purposes, a term indicating non acid, non-ripened, and may refer to the flavors of butter, cheese, ice cream and some other dairy products.

Sweet Butter—See Butter.

Sweet Clover—Sweet Clover Screenings—Sweet Clover.

Silage—See Feeds and Feeding.

Sweet Cream—See Milk and Cream.

Sweet Cream Butter—See Butter.

Sweet Curd Cheese—Sweet Curd Cottage Cheese—See Cheese.

Sweet Curd Holes—See Cheese Defects (Texture).

Sweet Curdling—See Milk and Cream Defects.

Sweet-cured—See Cheese

Sweeten (Soil)—To free from sourness, as soil. Usually refers to the correction of soil acidity through use of some form of lime or ground limestone.

Sweetened Condensed Milk and Composition of—Sweetened Condensed Skim Milk and Composition of—Sweetened Condensed

Whole Milk, Composition of—See Milk, Processing and Processing Equipment.

Sweetose—A trade-name for an enzyme-converted colorless corn syrup of the following approximate composition

Moisture	17.0%
Dextrose equivalent	61.5%
Carbohydrate solids composition:	
Dextrose	43.0%
Maltose	23.0%
Dextrins	34.0%

In ice cream manufacture, this type sugar is used to replace some of the sucrose, to impart definite qualities to the body and texture of the ice cream

Sweet Potatoes—Sweet Sorghum—See Feeds and Feeding.

Sweet Water—1. Fresh, sweet, clean, potable water free from bacteria and harmful minerals, used in the creamery chiefly for washing butter in the churn.

2. Chilled fresh water used in some milk plants as a cooling agent in certain types of milk coolers in which brine can not be used because of its corrosive action on the metal tubing through which the cooling agent must flow
See Sweet Water Tank.

Sweet Water Tank—A piece of creamery equipment of either wooden or metal construction used to hold fresh, sweet, clean, water for the specific purpose of washing freshly churned butter in the churn. This tank provides a convenient supply of water at a desired temperature. It may be equipped with brine pipes or direct expansion coils for cooling the water. The tank may also be equipped with a float valve by means of which a constant level of water is maintained. As fast as cooled water is drawn for use, fresh water automatically enters the tank. See Sweet Water.

Swell (Over run)—See Ice Cream.

Swell Heads or Bloats—See Defects—Dried and Evaporated Milks, and Cheese Defects (Swiss)

Swill—See Feeds and Feeding.

Swing Churn—Swinging Churn—See Butter.

Swiss Butter Printer—See Butter.

Swiss Cheese—Swiss Cheese Cultures—Swiss-Closed Surface—Swiss Cheese Set—Swiss Cheese, Well Developed Eyes in—Swiss Cooking Cheese—Swiss Harp—Swiss Kettle—Swiss Standards—See Cheese.

Switzer (American Swiss, Swiss, Emmental)—See Cheese

Symbiosis—The living together in more or less intimate association of two dissimilar organisms, with a resulting mutual benefit since neither organism can function without the other. Common examples are: lichens (algae and fungi living together); leguminous plants (clover etc.) living in association with rhizobia, a genus of small rod-shaped bacteria commonly called nitrogen fixers because, while living in the root nodules of the plant, they absorb free nitrogen from the air, and after the death of both plant and bacteria the nitrogen becomes a part of the soil.

Symmetry (In Livestock)—Perfection of proportion in build, the harmony of all parts or section of an animal viewed as a whole with regard to the standard type of the breed it represents.

Symptom—An external condition suggesting the presence of disease.

"Synthesis"—Synthetic detergents which have good detergent properties and are also surface active agents. Many of them have emulsifying properties.

Not to be confused with Surfactants, some of which are poor detergents even though they have excellent wetting power.

Syncretism—See Cheese.

Synergism—Opposite of antagonism. In bacteriology, the working together of two or more microorganisms of different species to the mutual benefit of each, neither of which could function in the same manner when living alone. Ex.—The production of gas when two species of bacteria grow together in the presence of a carbohydrate, when neither organism growing alone can produce gas. One of the species, however, must be able to ferment glucose.

Synthesis—Chem. The art or process of building up a compound by the union

of elements or simpler compounds Opposite site of analysis

Synthetic—Anything produced by synthesis combining parts so as to produce a whole See **Synthetic Milk Medium**

Synthetic Cream—See **Milk and Cream**

Synthetic Milk Medium—Artificial milk As suggested by Whittaker, it is made as follows Fifteen grams of pure caseinogen are dissolved in 100 ml of a 1% solution

of sodium hydroxide in distilled water The solution is diluted to about 900 ml with distilled water Ten grams of lactose and 1 gram of calcium chloride are added and the solution made up to 1000 ml with distilled water It is then neutralized and made + 0.3 with 0.1 N hydrochloric acid, using phenolphthalein as an indicator This milk is used largely for bacteriological media

Syrups—How to Make For Fountain Use—See **Ice Cream**

T

Tables—Weights and Measures Temperature, Comparisons See **Reference Section**

Tachometer (takometet)—An instrument devised for measuring speed as revolutions per minute of engines

Tackle—An arrangement of ropes and pulleys arranged for hoisting or pulling so as to change the point of application of the pulling force to a convenient place and thus enable a small force to overcome a larger resistance

Taffelost—Taffi Cheese—See **Cheese**

Tailboard—The board at the rear end of a wagon or truck which can be removed or let down for convenience in loading or unloading

Tali Cheese—Taleggio—See **Cheese**

Tallow—The fat of animals (beef and sheep) It is white and almost tasteless when pure and is used more or less in soap, in candles, in margarine, in candies and in many other industries

Tallowiness—Tallowy Flavor—See **Butter Defects**

Tame—Animals trained from a wild to a domesticated state

Tame Hay—See **Feeds and Feeding**

Tame Cheese—See **Cheese**

Tank Cars—Express-car type railroad cars having a glass lined steel tank mounted at each end for the transportation of milk into the city on long hauls from country receiving stations. The tanks are insulated with 2 inch corkboard and have a standard capacity of 3000 gallons each, although

some are now being built to hold 3820 gallons The cars are usually unloaded by either compressed air or pump devices Generally refrigerated

Tank Pick Up—A method of collecting milk at the farm in refrigerated tank trucks Capacity may vary from 500 to 3,000 gallons

Tank Trucks—Motor trucks upon which are mounted metal tanks for the transportation of milk Tanks are usually made of glass-lined steel, tin lined copper, nickel, or stainless steel The capacity of the tanks varies from 500 to 2000 gallons 1250 gallons being the most common size The larger tanks are used with trailers or semi trailers The use of tank trucks is practicable only where a full load of milk can be picked up at one or two receiving stations They are not adapted for 'pick up' service The special field of the tank truck seems to lay in a haul of from 120 to 150 miles per round trip At the city plant the tanks are unloaded by the pump, compressed air or gravity method The semi trailer tank truck is often used for transporting milk from a tank car at the railroad terminal to the city plant. The semi trailer tank can be detached at the plant, the auxiliary wheels lowered to support the front of the tank trailer leaving the truck free to go to the terminal for another tank trailer.

Tankage—See **Feeds and Feeding**

Tannin—A constituent of cocoa often responsible for the greenish black discoloration of chocolate ice cream when exposed to iron

Tauzenberger—See **Cheese**

Tapeworm—Any of numerous worms parasitic when adult in the intestines of animals and man. Its body is long, flat, and composed of numerous segments

Taping (in cheesemaking)—See Cheese.

Taproot—A root system in which the primary root continues prominent in contrast to a fibrous root system.

Taryk—See Milk—Fermented.

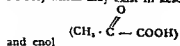
Taste of Milk, Primary—(Natural Foundation Taste)—The taste impression from all the taste-giving ingredients which milk normally contains due to its chemical composition, exclusive of anything of a foreign nature that the milk may have acquired. Normal milk has a very bland flavor with a faintly sweet character.

Taste of Milk, Secondary—All the taste impressions from different sources such as feed and products of disease, added to the primary taste of milk. It is necessary to eliminate these secondary influences in order that primary tastes can be properly determined.

Tämjölk-Tatté Mälk (Taatic)—See Milk—Fermented.

Tattoo—Tattooing—The indelible mark or scar made by tattooing. A method of punching small holes with a die in the form of numbers or letters through the skin, usually in the inside of the ear of cattle and then filling in with tattoo ink. This will give a permanent mark for identification.

Tautomerism—A chemical phenomenon whereby a chemical compound may have two different formulae representing one constitution. Both forms exist at the same time in equilibrium. The amount of either form may be increased or diminished by changing the conditions under which they react. An example is pyruvic acid ($\text{CH}_3\text{CO}-\text{COOH}$) which may exist in keto



$\begin{array}{c} \text{OH} \\ | \\ (\text{CH}_3 = \text{C} - \text{COOH}) \end{array}$
forms in equilibrium with each other.

T.D.N.—See Total Digestible Nutrients.

Teats—See Cheese.

Teat—The protuberance on the udder through which milk is drawn from a mammal; a nipple. Cows normally have four teats, one for each quarter of the udder.

See also Abortive teats, After teats and Supernumeraries

Teat Canal—The small duct, about $\frac{1}{2}$ inch long, in the lower end of the cow's teat through which the milk is drawn. Its upper end widens into the teat cistern. Also called Streak Canal.

Teat Cup—One of the cup-shaped parts of a milking machine, fitting around the teat

Teat Dilator—A medicated wax or steel-chrome plated object which is passed into the teat openings of a cow's udder in order to keep the teat open and free from obstructions so that milking is made easier. After an operation on teats, dilators are used to prevent closing of the aperture by adhesion of the healing surfaces.

Teat Slitter—An instrument sometimes used on the teats of hard milking cows. It is passed into the teat opening, and by means of a screw a small knife edge is projected on one side at the upper end, and the instrument is then withdrawn. The knife blade cuts the side of the teat duct and the surrounding muscles. A hard-milking teat is generally caused by a strong sphincter muscle which closes the teat opening tighter than it should.

Teats, Chapped—Sores & Scabs—Wounds—See Diseases in Cattle.

Teats, Leaky—Teats of a cow's udder which leak milk freely between regular milkings. This condition may come about through injury to the teats, such as slitting open or through naturally weak sphincter muscles which ordinarily control the size of the opening of the teats. Can be remedied by surgery.

Techniques—See Dairy Tests.

Tedder—A machine for stirring and spreading hay so hasten drying and curing.

Teeswater—A breed of cattle formerly bred in England, and supposed to have originated by crossing Holland bulls on native cows, and so have been the principal stock from which the Shorthorns were derived.

Telegony—A fallacious breeding belief which holds that offspring are likely to be affected by previous impregnations of the mother. According to this belief, a pure bred Jersey cow bred to a Jersey bull after dropping the offspring of an Ayrshire bull, would not drop a purebred Jersey calf. The belief probably arose through the occasional appearance of throw backs as in atavism or reversion. See **Tthrowback**, or **Throwing back**.

Teleme Cheese—**Telescopic Hoop**—**Telpanir**—See **Cheese**

Temperature—The condition of a body which determines the transfer of heat to or from other bodies. Temperature is measured in terms of arbitrary scales such as the centigrade in which the freezing and boiling points of water are set at 0° and 100°F, respectively.

Temperature Shock—Unfavorable effect of too rapid temperature change on viability of spermatozoa or other cells.

Tempering Room—See **Cheese**

Tenant Farmer—A farmer who tills soil owned by another, paying rent either in cash or in shares of produce.

Tendon—A tough cord of dense, white fibrous connective tissue uniting a muscle with some other part and transmitting the force which the muscle exerts.

Tennessee Valley Authority (TVA)—A government agency created by act of Congress, 1935, consisting of a board of three members with power to develop the Tennessee River system (area of about 40,000 square miles in seven states) for the purpose of flood control navigation, and the creation of water power, to generate and sell surplus electricity, to develop fertilizer, to aid in soil conservation, reforestation, etc. Considered a model for other projects.

Tensuometer—An instrument for measuring the surface tension of liquids.

Tecante—**Tepary Beans**—See **Feeds and Feeding**

Terrace (Soil conservation)—A constructed channel or gutter built across a slope for the purpose of leading large quantities of water down a gentle grade to a protected outlet. A diversion terrace is always maintained in sod. A cropland terrace may be

plowed and cropped with the rest of the field.

Terramycin—See **Antibiotics**

Terrazzo Floor—One type of floor sometimes used in dairy plants. It consists of a concrete base, about one inch of cement surfacing with irregular shaped marble chips spread and rolled into the cement. Terrazzo floors are not entirely satisfactory because they have a tendency to crumble when exposed to sudden changes in temperature.

Terzolo—See **Cheese**

Test Bottle (Babcock Milk)—A specially designed bottle, the original having a base capacity of about 50 cc and the neck graduated from 0 to 10% by 0.2% divisions. Later this was cut down to read from 0 to 8% by 0.1% divisions. Both types are in use today, although the 8% bottle is more widely used and is now the standard bottle of the A.O.A.C. A bottle of the same type but with larger capacity is in use for testing cream.

Testing—See **Dairy Tests**

Testing Period—The day or days when a milk tester makes the tests for cows' milk and butterfat record which be used in computing the record for a testing period of one month.

In **Dairy Herd Improvement Association** work the cow tester visits each herd in his association once a month.

Testis (pl testes)—One of the two male reproductive glands located in the scrotum which produces spermatozoa. The testis produces a hormone, testosterone, which governs development of the accessory male reproductive organs and secondary sex characters. Also called a **testicle**.

Test Supervisor—An agent appointed by a college or experiment station to conduct an official test. His duties are to watch the milking of each cow on official test, weigh the milk and make a test for butter fat, and to report his findings to the breed association.

Tetany of Calves—**Diseases in Cattle**

Tete de Maure Cheese—See **Cheese**

Tetracoccus—A group of four cocci produced by the division into two planes of certain cocci.

Tetraploid—In genetics, a term descriptive of a somatic cell which contains double the usual number of chromosomes in normal diploid cells. This abnormal condition is one of the manifestations of mutation. The tetraploid condition is caused by duplication and division of the nuclear material without cellular divisions or by the failure of a pair of chromosomes in both sperm and egg to separate at the first maturation division, with the result that they both pass to the same pole. When sperm and egg unite, they form a zygote which is tetraploid. A relatively common condition in plants leading to new species, but rare or unknown in higher animals.

Tewfikose—A carbohydrate found in the milk of the gamoose (Egyptian buffalo).

Texas Fever—See Diseases in Cattle

Texel Cheese—See Cheese.

Texturizer—See Buttermaking, Continuous Process.

Texture—The size, shape, and arrangement of the small individual particles which go to make up the finer structure of any substance. In the dairy industry, the term is one of a number of criteria used in estimating the quality of butter, cheese, and ice cream. Specifically, in cheese, texture refers to the openness of the cheese whether mechanical or bacteriological.

Texture, Soil—See Soil Texture

Thallophytes—A group of cryptogamous plants of low structure, including algae, fungi, lichens and bacteria.

Theelin (estrone)—A colorless, crystalline, water-soluble hormone that stimulates changes characteristic of oestrus and induces growth of the female genital organs. It is found especially in the follicular fluid, but also in the placenta, and in the blood and urine of pregnant females. See Estrogenic Hormone.

Theray Cheese—See Cheese.

Therm—A unit of heat; a name proposed by a committee of the British Association of Science in 1896. See British Thermal Unit (B.T.U.).

Thermal Capacity—The amount of heat required in raising 1 lb. of a substance through 1 degree; that is, it is the product

of the weight of the substance by its specific heat.

Thermal Conductivity—The conductivity of a substance is measured by B.T.U. transmitted per hour, per square foot, per inch, per degree difference in temperature on two sides of the plate. This constant (k) is different for different materials.

Thermal Death Point—In bacteriology, that point above the maximum temperature for growth at which the bacterial cell is destroyed by heat. It varies for different types of organisms and must also be reckoned in relation to the time allowed for heating. It may be expressed as the temperature time relationship which together with less well-known factors results in the destruction of the living cell. In the laboratory, the thermal death point is generally considered as the lowest temperature at which a culture of living organisms held in a water bath will be killed in ten minutes.

Majority thermal death point is the temperature at which the majority of bacterial cells are destroyed in a given time.

Absolute thermal death point is the temperature at which after a given time, all cells are destroyed. The absolute point and majority point are of importance in determining the pasteurization temperature for milk and other products.

Thermal Efficiency—Ratio of net work (in heat units) to the best value of the fuel supplied; as used in internal combustion engines.

Thermal Shock—See Temperature Shock.

Thermocouple (Thermopile)—An apparatus for measuring temperature based on the principle that an electric current (which can be measured by a galvanometer) can be produced in a closed circuit by heating the point of contact of two dissimilar metals.

Thermophilic Bacteria—Organisms which grow rapidly at temperatures ranging from 120°F. to 140°F. (50°C. to 60°C.) and are able to survive temperatures higher than 176°F. (80°C.), but lie dormant until favorable growth temperature is reached. They often are cause of trouble in milk plants.

Thermometer—An instrument used to ascertain, indicate, or register temperatures

or degrees of heat, constructed on the principle of the expansion of fluids by heat. Mercury is the fluid usually employed, but alcohol is used for low temperatures.

Thermometers, Check of—Due to rough handling or for many other reasons, thermometers may become inaccurate and should be checked often against an official standard thermometer kept for that purpose. Among the causes of inaccuracy are breaking the column of mercury and a slide in the scale as compared to the mercury table.

Thermometer, Recording—A clock like device for making a permanent record of temperatures. It is used in pasteurizers, refrigeration rooms, coolers, etc. It consists of a flexible mercury tube with a sensitive bulb on one end and a recording case on the other. Within this case the temperature is recorded on a slowly revolving chart by an ink fed pen.

Centigrade—A scale for indicating temperature whereon the freezing point of water under sea level atmospheric pressure is indicated as 0° and its boiling point by 100°, the space between these points being divided into 100 equal divisions, or degrees. Degrees Centigrade (°C) equals degrees Fahrenheit (°F) minus 32, multiplied by 5/9. Degrees Fahrenheit equals degrees centigrade multiplied by 9/5, plus 32.

Fahrenheit—A scale for indicating temperature whereon the freezing point of water under sea level atmospheric pressure is indicated as 32°F and its boiling point 212°F, with 180 equal divisions or degrees between.

Fahrenheit degrees may be converted to Centigrade by using the following formula: $(F - 32) \times 5/9 = C$

Reaumur, R—A temperature scale used in Europe in which the freezing point of water is 0° and the boiling point is 80°. Abbreviated R. Sometimes used in the U. S. by native Swiss operators in the making of Swiss cheese which is cooked to 12–43°R. Degrees R, multiplied by 5/4 equals degrees Centigrade.

Stem Thermometer—The commonest form with mercury or spirit in a glass tube which may have the temperature readings engraved on it or may be marked on the background or support of the instrument. The liquid in the bulb expands when heated and contracts when cooled. This change in volume causes the liquid to rise and fall in the tube or stem.

Wells, Thermometer—Either stubs of small pipe, welded in, or threaded wells, installed where temperature measurements may be required in a refrigeration system. This well is filled with oil or mercury to give good conductivity from the well to the thermometer bulb inserted in the well.

Thermophiles—Heat loving organisms. Bacteria which grow in the range of 60 to 80°C (140 to 176°F). Therefore, many of these survive pasteurization temperatures and thus are apt to cause trouble in milk plants. See Obligate Thermophiles, Thermophilic Bacteria, and Mesophilic Bacteria.

Thermophilic Bacteria or Thermophiles—Bacteria which are active at high temperatures, usually between 37 and 75°C (88.6 and 167°F) with an optimum between 45 and 55°C (113 and 131°F). They may survive pasteurizing temperatures of 176°F for a very short time.

Ayers and Johnson isolated a true thermophilic organism from pasteurized milk, naming it *Lactobacillus thermophilus*. Thermophiles are an important cause of high bacterial counts and pin point colonies in pasteurized milk.

Thermopile—See Thermocouple.

Thermo-Stable—Stable to heat or when heated. Said of enzymes, vitamins and immune substances which can be heated to moderate temperatures without losing their special properties.

Thermostat—An automatic device for regulating temperatures by checking the heating furnace damper which in turn regulates the supply of gas or other heating fuel. A thermometer with electric controls instead of a needle or recording pen.

Thiamine—See Vitamins.

Thickened Sweetened Condensed Milk—See Dried and Evaporated Milk Defects.

Thin—In soil, a poor, infertile, thin soil. In livestock, not fat, plump or stout, as a thin cow. In plants, to thin out excess number of plants to get the desired start.

Thixotropy (Chemical)—The phenomenon shown by certain colloidal systems of changing their condition on being stirred or shaken. A concentrated hydrosol of ferric oxide is a notable example at rest a condition of rigidity is noticeable, while stirring restores the sol condition.

Thoroughbred—A breed of running horses originating jointly from English running mares and the Arabian, Barb, and Turk stallions, which were imported into England in the 17th century. The term is often erroneously used in referring to purebred cattle.

Thousand-headed Kale—See Feeds and Feeding.

Three Hundred and Five Day Record—A record of the milk and butterfat produced by a cow in 305 days from the date of freshening. The various breed associations set up production requirements and based on length of time a cow normally carries a calf, during the 305 days (ten months).

Three-quarter Fat Cheese—See Cheese

Threonine — $\text{CH}_3\text{CH}(\text{OH})\text{CH}(\text{NH}_2)\text{COOH}$
An amino acid found in milk proteins. Casein contains about 4.9 and β -lactoglobulin about 5.8 gms. per 100 gms.

Threshold Point of Clumping—The point at which the clumping of the fat in milk or cream is sufficiently in evidence under the microscope to be definitely determined by observation with the low power objective (16 mm objective and 10 x eye piece—draw tube down).

Throwback—An individual organism which manifests certain characters peculiar to a remote ancestor or to the original type (recessive characters) which have been in abeyance during one or more of the intermediate generations.

Throwing back—The production of offspring exhibiting atavism or reversion. See Telegony, Atavism, Reversion.

Thumb Test—A simple test for determining the gel strength of different gelatins by noticing the resistance of gels to the touch of the thumb. It is a test for comparative purposes only.

Thumping—See Cheese.

Thunder and Lightning, Effect on Milk—Many still believe that thunder and lightning contribute to the souring of milk. There is no scientific evidence warranting this conclusion. Souring probably is induced by the more humid and higher prevailing temperatures common during thunderstorms.

Thurl—The hip joint in cattle.

Thymol—A preservative sometimes used for preserving milk samples held for chemical analysis.

Thyroid Gland—A large ductless gland below the pharynx or in the neck. It is a median ventral outgrowth of the pharynx. Two lateral outgrowths commonly appear, forming accessory thyroid glands. The thyroid gland secretes a hormone, thyroxine, a complex iodine compound which increases basal metabolism and in young animals has a definite influence on development and growth. There is an important functional relation between the thyroid, pituitary and adrenal glands.

Thyroprotein—See Iodinated Casein.

Thyroxine—The active principle of the thyroid gland which regulates the rate of cellular metabolism.

Tibet Cheese—See Cheese.

Tick—Any of several arachnids which attach themselves to man, animals, and birds, and suck their blood. The young have six legs, the adults eight.

Ticket System (Milk Tickets)—A cash method of collection for milk deliveries. The driver sells tickets to customers for cash in advance, and at the time of delivery collects a ticket for each quart of milk delivered. Although this system has many advantages, it is not used to any great extent.

Tight—Impervious to moisture; as, a tight soil.

A term denoting unusually slow drainage of water through a subsoil.

Tignard Cheese—See Cheese.

Tile—A piece of fired clay designed for various purposes, including drainage; earthenware drain; as a pipe or gutter; also, a pipe.

Tile Clip, Boco—A molded polyethylene plastic device for drainage systems to replace roofing paper. Such a device acts as a cover to protect the openings between drain tile as well as to provide uniform and proper spacing between individual sections of drain tile.

Tile Drains—Drainage systems employing the use of tile made of clay or other material, laid below the surface of the soil to carry off excess water.

Till—To cultivate and prepare for seed to sow, raise and harvest crops. It also refers to material left by the glacier, such as Glacial Till.

Tillage—Has to do with the tilling and improving of land for crop purposes.

Tiller—One who tills the land and cares for growing crops. A stem or branch of grasses.

Tillmaos-Luckebach Test—See Dairy Tests.

Tilsit Cheese—See Cheese.

Tiltable Vat—See Cheese.

Tilth—The workability of a soil and its condition in relation to plant growth. Refers to moisture, aeration and fitness for the growth of plants.

Tuner—A device in the ignition system of an internal combustion engine, causing the spark to be produced in the cylinder at the correct time, either by the interruption or by the closing of the primary circuit.

Timothy—See Feeds and Feeding.

Tin—A rather soft white metal used as a protective coating for iron, steel, copper and other metals previously much used in dairy equipment, thereby protecting the equipment against corrosion and absorption of undesirable flavors. Tin coating on copper surfaces often wears through in a short time especially when heat is applied and the equipment must then be retinned. Before the advent of stainless steel tin was quite commonly used for the plating of iron and copper used in dairy equipment.

Titer—In testing for acidity the number of cc. of tenth normal sodium hydroxide necessary to exactly neutralize a given amount of liquid in testing milk and milk products, the titer is expressed as the so-called per cent of lactic acid. In reality, the titer represents, in fresh milk, no lactic acid at all, but other acids, and buffer substances such as phosphates, citrates, albumin, casein and dissolved carbon dioxide. However, since the increase in acidity caused by fermentation is due mainly to lactic acid, the titer is expressed

as though the acidity were all due to lactic acid. See also Titration.

Titrateable Acidity—The equivalent of the amount of alkali required to shift the pH of milk to an arbitrarily chosen end point at which phenolphthalein becomes pink at about pH 8.3.

The titrateable acidity of fresh milk, ranging from 13 to 20 ml of N/10 NaOH per 100 ml is due to the buffer action of dissolved CO₂, phosphate, citrate and proteins. In sour milk the lactic acid produced by the action of bacteria on lactose is also included. Titrateable acidity even for fresh milk is often expressed in terms of percentage lactic acid, (See Manns Acid Test).

Tocopherols—A group of fat soluble compounds which are necessary for normal reproduction in many animal species (vitamin E function). They also serve as antioxidants. Milk contains about 1 mgm of tocopherols per liter.

Toggenburg—A breed of milk goat developed in the Toggenburg district of Switzerland, origin rather obscure.

Toggle Vat Gate—See Cheese.

Tolerance (in plants and animals)—The ability to withstand unfavorable conditions of drought, climate, insects and disease.

Tomato Pomace—See Feeds and Feeding.

Tomé de Beaumont—See Cheese.

Ton—A unit of weight the weight of 2000 lb often called the short ton, used in the United States for weighing hay, grain, straw, etc. equals 907.20 kilograms.

Tongue Loller—An animal that permits the tongue to hang out.

Too Soft Texture—Too Sweet Flavor—See Ice Cream Defects.

Toothed Bur Clover—See Feeds and Feeding.

Top—In breeding to improve domestic animals, by crossing certain individuals or breeds with superior animals.

In marketing the high price for the day or the week.

Top Cross—A cross in which superior or purebred individuals or breeds, usually males, are mated with inferior stock; a generation of ancestors in which one parent has superior qualities; the product of such a cross; in a narrow sense a paternally superior cross only.

Top-dress—To apply fertilizer to land without working it in. This may be ordinary manure, lime or commercial fertilizer.

Topfilse—See Cheese.

Top Off (Livestock)—To finish feeding, as livestock for the market.

Topography—The land features of a local ity. The general contours of land

Toppen Cheese—See Cheese

Toppings—See Ice Cream

Topsoil—See Surface Soil

Tord Cheese—See Cheese

Tornillo—See Feeds and Feeding

Torque—That which produces or tends to produce rotation. When given in pounds-feet, it is equal to force in pounds multiplied by lever arm in feet. When given in pounds-inches, it is equal to force in pounds multiplied by lever arm in inches.

Torula Cremoris—A lactose fermenting yeast found in gassy or split rind Swiss cheese. It has an ellipsoidal shape and grows best at 37°C. (98.6°F.).

Torulae—A genus of budding fungi which do not form ascospores (spores not enveloped in a sac) and hence are not classified as true yeasts. They produce CO₂ and small amounts of alcohol from lactose. Commonly present in cream. Two lactose-fermenting *Torulae*, *Torula cremoris* and *Torula sphaerica*, were isolated from "yeasty" cream by Hammer and Cordes. *Torulae* cause "yeasty fermentation" in cream and this condition can be avoided by keeping the cream at low temperatures (50°F. or below) or by pasteurizing.

Torula Sphaerica—A yeast having a spherical shape. There is often little or no growth of this organism at 37°C. (98.6°F.), the optimum temperature being somewhat lower.

Toscanello-Tosceno, Sardo, Incanestrato—See Cheese.

Total Digestible Nutrients (T.D.N.)—A term in animal feeding which designates the sum of all the digestible organic nutrients—protein, fiber, nitrogen free extract, and 2.25 times the fat in a feeding stuff. The fat is multiplied by 2.25 inasmuch as its energy value is about 2.25 times that of carbohydrates. The letters T.D.N. are frequently used instead of the full term.

Total Dry Matter—Dry Matter in feeds is weight of feed minus water driven off by oven drying. This is determined by chemists by weighing a finely ground sample of the feed before and after drying in the oven until no more water is driven off. Percentage of dry matter is found by ascertaining the per cent of water and subtracting this from 100%.

Total Solids (T.S.)—Moisture free, and not to be confused with dried products such as powdered milk, cocoa or gelatin, all of which contain some moisture in spite of their dry appearance.

Total Solids, Determination of—Determination without Mojonnier Equipment—See Dairy Tests

Total Solids, Formula for Calculating, in Ice Cream—Total solids in ice cream can be determined by weighing a sample, say 10 grams of the mix in an aluminum dish, and drying in a hot air oven at 160°C. (320°F.) until the weight becomes constant. Then weigh and compute the percentage of total solids using the weight of the mix sample as 100%. To get satisfactory results obviously a sensitive, analytical balance is necessary.

Total Solids of Milk—In dairying, the constituents of milk other than water. The fat and solids-not-fat together make up the total solids. A formula has been worked out so that with the lactometer reading given and the amount of fat known, the solids-not-fat and total solids can be calculated. Since the density of the milk varies with the temperature, unless the lactometer reading is taken at 60°F., a correction of .1 of a lactometer degree is made for each degree of temperature above or below 60°F. If taken above 60°F., .1° is added for each degree of temperature above 60°F. If taken below 60°F., .1° is subtracted for each degree of temperature below 60°F.

Total Solids, Formula for Calculating in Milk

$$TS = 1.2 \times \% \text{ fat} + \frac{\text{lactometer reading}}{4}$$

$$SNF = 0.2 \times \% \text{ fat} + \frac{\text{lactometer reading}}{4}$$

$$\text{Specific Gravity} = \frac{\text{lactometer reading}}{1,000} + 1$$

Touareg Cheese—See Cheese

Toughness—As applied to a material expresses a combination of strength and ductility, resistance to fatigue, tension, compression, and shear

Touloumsio—See Cheese

Toxaphene—A chlorinated organic insecticide which is being used experimentally on cow and sheep ticks, etc.

Toxic—Poisonous or unfavorable for normal growth or development

Toxicity of Metals—There is evidence that metals such as arsenic, lead and mercury when taken into the system even in small quantities for long periods of time are poisonous. Therefore, these metals should not be used where contact is made with milk or its products while processing. No particular poisonous effects are traceable to tin, copper, stainless steel or aluminum although accumulation of verdigris on copper or brass surfaces and other products of corrosion should be thoroughly removed before dairy products are processed.

Toxins—Very poisonous substances of bacterial animal or vegetable origin and usually of a protein nature. See Food Poisoning.

Trace Elements—Elements added to fertilizers in small amounts where it is thought they are needed. Most common are cobalt, zinc, molybdenum, copper, manganese and boron. They are required by plants in very small amounts.

Trace elements usually found in milk are rubidium, lithium, barium, strontium, manganese, aluminum, zinc, boron, copper, ferrum, cobalt and iodine.

Trade Association—A voluntary organization of business competitors, usually in one branch of the industrial, trade, or

service fields, whose aim is to promote that branch through cooperative activities in two or more of the following phases: accounting practice, arbitration, business standards, commercial research, public relations, statistics, and trade promotion.

Transpiration—The emission or exhalation of watery vapor from the surface of green plants. It facilitates root absorption, thus allowing a constant supply of mineral food to enter the plant body. It is largely effected through, and partly regulated by, the stomata (the minute openings in the outer layer of leaves and stems).

Transplanted Bovine Ovum—The transplanting of a fertilized egg of one cow into the uterus of another cow resulting in the birth of a normal calf at the end of the normal number of days required. Such transplanting has been done successfully in a few cases. About 4 days after breeding, the first cow is slaughtered and the eggs flushed out of her reproductive organs and later placed into the uterus of the second cow. It is hoped scientifically the process may have possibilities.

Trap—A device for drains, sewers, etc., consisting of a bend or partitioned chamber in which the liquid forms a seal to prevent the passage of sewer gas, etc.

Trappist Cheese—Travnik Cheese—See Cheese

Tray Pack Cabinet—An ice cream cabinet in which refrigeration is provided by removable trays of ice and salt set next to the cans of ice cream. Not now in general use.

Trece—See Cheese

Tree Leaves and Twigs—See Feeds and Feeding

Trembles—See Diseases in Cattle

"Tremetol"—A poisonous substance found in some plants which has been proved to be the cause of 'trembles'.

Trench Silo—See Silo, Trench

Trend—In marketing the general direction of prices, higher or lower.

"Trends in Pasteurization"—See Handbook, P 81

Tribe—In stockbreeding, a group of animals descended from a female progenitor, through the female line.

Trichina—A small slender nematode worm which, in the larval state, is parasitic, often in immense numbers, in the voluntary muscles of hogs, man, and other animals. When the larvae, in insufficiently cooked meat, usually pork, are swallowed, they are liberated and reproduce rapidly. Their presence in large numbers produces trichinosis.

Trichomonas Fetus—A species of protozoa responsible for the venereal disease, Trichomoniasis, which causes early abortion and reproductive difficulties in cattle. It is spread largely through the use of infected hulla.

Trichomoniosis—See Diseases in Cattle

Trier—In dairying, a long, semi-cylinder of metal with a handle used in obtaining cheese or butter plugs for judging purposes.

Trimming (Livestock)—Removing part of the hoof of an animal.

Docking and castrating sheep.

Removing wool from a sheep, as in blocking.

Clipping hair from an animal.

Trimethyl Amine—See Butter Defects (Fishy Flavor).

Triple A—Meaning the Agricultural Adjustment Administration, AAA.

Triple Foil Parchment—Butter wrapping material consisting of a sheet of aluminum foil sandwiched between two sheets of parchment paper. Also called Parchfoil.

Trisaccharide—A carbohydrate which upon hydrolysis yields three molecules of the simple sugars.

Tri-sodium Phosphate— Na_3PO_4 . An alkali used as an ingredient of washing powders for dairy use. It is an excellent water softener and has good emulsifying properties and buffer qualities. However, an objection is the greater difficulty in removing it by rinsing. It is rather hard on the hands. When used in combination with soda ash it becomes a more desirable washing powder.

Trituration—The act of grinding to a very fine powder. In physiology, masticating food to minute fineness.

Trocar—A sharp, pointed instrument used for piercing animal tissue. The trocar is

very often used in conjunction with a cannula (a small tube of glass or hard rubber used in surgery) for making an opening in the nose of an animal to be ringed. It is also used for piercing the side of an animal to relieve a severe case of bloat.

Trockenkäse Cheese—See Cheese.

Troemner Cream Balance—Sufficiently sensitive balance scale used in weighing cream for the Babcock test.

Trommel—See Cheese.

Trommsdorff Method—See Dairy Tests.

Trough—A large, usually fixed, boxlike, open vessel, long and comparatively shallow, as one used to hold water or feed for livestock.

Trouville Cheese—See Cheese.

Trowbridge Calibrator—A brass plunger used in testing the accuracy of glassware for the Babcock test. After the bottles are filled to the zero mark with either colored alcohol or mercury, this plunger of exact dimensions (varying with different types of test bottles) will raise the liquid from the zero mark to the uppermost desired mark; for ex.—to the 50% mark if 50% cream test bottles are being tested. This method of testing is rapid and generally satisfactory, but not as reliable as certain more accurate methods.

Troyes Cheese—See Cheese.

Truckle Cheddar—Sutton—See Cheese.

True Lactica—A common name for milk organisms like *Streptococcus lactis* and *Lactobacillus bulgaricus*; or those organisms found in milk which ferment the lactose chiefly to lactic acid with small amounts of other by products.

True Stomach—The 4th stomach of the cow. Same as Abomasum.

Truncate—(Agronomy) Ending abruptly as if cut off transversely.

Trunk—(Livestock)—The body of an animal apart from the head, or limbs.

Trypsin—A proteolytic enzyme elaborated by the pancreas. It acts on proteins and partially hydrolyzed proteins which reach the intestines in the form of peptones and proteoses breaking them down into amino acids. In this form they are absorbed and

are used in building the protein tissues and in providing the protein in the products produced, such as milk. Although the enzyme is secreted in an inactive form, it is activated by the enterokinase of the intestinal juice.

Tryptophan— $C_{11}H_{12}O_2N_2$ —An amino acid present in milk proteins. Casein contains 12 gms, B lactoglobulin 19 gms and a lactalbumin 70 per 100 gms.

Try Square—An instrument consisting of two straight edges secured at right angles to each other and used for laying off right angles and testing whether work is square.

Tschil Cheese—See Cheese

Tub—Tub Butter—See Butter

Tuber—The fleshy underground portion of the stem of certain plants in which considerable food storage occurs, such as the Irish potato. The buds or eyes of tubers may be planted for the production of another crop.

Tubercle—The small nodule or group of nodules which make up the lesion of tuberculosis.

A swelling. A rounded, solid elevation on skin, mucous membrane or surface of an organ.

A nodule on the roots of leguminous plants.

Tuberculin—A laboratory product prepared by sterilizing, filtering, and concentrating the liquids in which the *tubercle bacillus* has been allowed to grow. It contains no living bacilli and hence is unable to cause disease or injure an animal in any way. Used in making the tuberculin test.

Tuberculin Test—A test for determining the presence of tuberculosis in animals. It is accomplished by the introduction of *tuberculin*, (a sterile liquid containing the growth products of *tubercle bacilli*) into the animal and an interpretation of the results according to well known standards. The principal tuberculin tests are:
(1) the subcutaneous test (under the skin),
(2) the intradermic test (into the skin),
(3) the ophthalmic test (into the eye).
The tuberculin test renders an accurate diagnosis in more than 90% of the cases tested. It has little or no effect on non-tuberculous subjects but causes inflammation at the sight of the injection, often

with a general rise in temperature, in tuberculous subjects.

Tuberculin Tested Milk—See Milk Grades of

Tuberculosis—See Diseases in Cattle

TB Eradication Plan—An orderly and well founded procedure for controlling tuberculosis in cattle and building a healthy herd from infected parent stock. After eliminating all open cases from the herd the remaining animals are subjected to the tuberculin test. The reactors are segregated into a separate herd with separate quarters, yards, and pastures. The healthy herd should be tested twice a year and reactors placed with the diseased herd. Calves from both groups are placed in a disease free environment and, from the second day on, must be fed with sterilized or pasteurized milk entirely. On the first day they must receive colostrum as this seems to be essential to their health. Since this provides a danger to the calves of tuberculous dams, the calves must be tested when a few weeks old, and reactors eliminated. As the new herd is being built up, the less valuable animals of the infected herd are gradually eliminated. However, the sooner reacting animals are disposed of, the safer one may feel that there will be no unexplained flare up of the disease.

Tubicorn—A hollow horned ruminant, Ex—cattle—sheep.

Tucked Up—Contracted, appearing as if drawn in or up, said specifically of the flanks or walls of the abdomen of a cow or other animal. Not in good condition or health.

Turf—The upper layer of earth filled with the roots of grass so as to form a tough mat generally known as sod.

Turmeric Paper—Absorbent paper colored with solution of the yellow coloring matter of turmeric (prepared from the roots of an East India plant, *Curcuma longa*). Turmeric paper is turned brown by alkaline solutions, and is sometimes used in place of litmus paper. It is used in detecting carbonates in milk.

Turn Under—To plow under manure or top soil from the surface.

Turning Cheese—See Cheese

Turnips—See Feeds and Feeding

Twdr Sir Cheese—Twin—See Cheese

Twins—Two offspring born at the same birth. They may be either fraternal or identical twins. **Fraternal** twins result when two ova (eggs) are fertilized by different sperm at the same time. Since their hereditary characteristics are different they may not resemble each other any more than other brothers or sisters, and they may be of the same or of different sex. **Identical** twins result from a single fertilized ovum which develops at two points, forming two separate embryos in the same enclosing membrane or after birth. Such twins have identical heredity, obviously alike in every respect, and all ways of the same sex.

Two, Four-D—(2, 4D)—2, 4-dichlorophen oxyacetic acid; a hormone-like substance effective in weed control.

Tworog Cheese—See Cheese

Type (Livestock)—Type refers to the conformation of an animal which indicates or suggests the purpose it serves. In animal husbandry, an ideal embodying all the characteristics which make an animal highly useful for a specific purpose, and consequently desired by the breeder, as

beef types, milking types. See Dairy Conformation or Type—Cow and Bull.

Typhoid Fever—A disease of man widely spread in temperate and tropical countries and often epidemic. The infecting organism is a small, gram negative, non-sporulating rod, *Salmonella typhosa* and the primary source of infection is the small intestine, causing excreta to be heavily infected. Typhoid outbreaks have been milk borne, and infection in the milk usually comes from infected persons handling it or from so-called typhoid "carriers" who have recovered from the actual illness but who still harbor the organism. Pasteurization of milk is one effective measure in fighting the disease. Strict sanitation and pasteurization should make such outbreaks most unlikely.

Type—Possessing the desired type or form as dairy type cattle.

Tyrosine (C₁₁H₉O₃N). An amino acid found in the proteins of milk. Casein contains about 63 and β-lactoglobulin about 3.8 gms per 100 gms.

Tyrosinemia—An antibiotic substance isolated from the soil bacillus, (*Bacillus brevis*) and consisting of two substances, Gramicidin and Tyrocidin.

U

Udder—The mammary gland or milk gland, of mammals. In the cow the udder is normally composed of four mammary glands generally with four teats, one for each quarter, but there may be one or more supernumerary teats. The left and right part of the udder are separated by a distinct median ligament. The udder in a well-developed dairy cow is attached well in front and has a rounded appearance, with attachments extending high behind. It ordinarily is soft and pliable.

Udder Anti-bodies—Doctors Petersen and Campbell of University of Minnesota, on the basis of recent experiments, believe that a cow vaccinated in the dry phase with preparations of killed bacteria will provide milk that will give the consumers immunity from many of the diseases from which humans now suffer. However, so far the protective power of milk antibodies has not been definitely established. The work is as yet in the experimental stages.

Ultracentrifuge—An apparatus devised by Svedberg enabling increased rate of sedimentation of colloidal particles owing to the imposition of enormously increased gravitational force. It is widely used to determine the particle size (molecular weight) of proteins.

Ultrafiltration—Filtration of colloidal solutions through special filters designed to hold back the colloidal particles.

Ultrasonic Aging—See Cheese.

Ultra-Sonic Pasteurization—See Milk, Processing & Processing Equipment.

Ultra violet Light—See Mold Prevention.

Ultraviolet Rays—The shortest light rays of the spectrum, with wave lengths less than 400 mμ, lying below the violet rays. The human eye is not sensitive to them. They have some power of killing bacteria.

and are also used in irradiation of milk, etc to fortify it with vitamin D

Umbilical Cord—The cord arising from the navel which connects the fetus of a mammal with the placenta

Umbilicus—See Navel

Unavailable Water—Usually refers to soil water that plants cannot effectively utilize

Unblooded—Not blooded, not purebred, a meaningless term

Unbroken—Untamed, unsubdued, as cow not broken to milking or horse not broken to riding or harness work

Unclean Flavor—See Cheese Butter, Milk Defects

Unclean Milk—See Milk and Cream Defects

Uncombined Casein—Base free casein, one of the resultants of the precipitation of casein by the natural sour method, the casein being precipitated as mono-calcium caseinate and as base free or uncombined casein

Underbred—Said of an animal not of pure breed See Grade

Underdrain—A concealed drain tile with openings through which the water enters when the water table reaches or is higher than the level of the drain, as one laid below a cultivated field, etc

Underearth—See Subsoil

Underfeed—Undermournish, to feed with too little food or feed for body needs and normal functions such as milk production. Underfeeding can be harmful to the animal body and uneconomical. It may be due to qualitative or quantitative deficiencies in the ration

Undergrade Cheese—See Cheese Defects

Undulant Fever—A disease in humans resulting from infection with *Brucella abortus* (Bang), the germ that causes infectious abortion in cattle. It is most often transmitted to humans through drinking raw milk from infected cows. But it may also be transmitted in goat's milk (*Brucella melitensis*) or in pork products (*Brucella suis*) or in beef (*Brucella abortus*) in the raw state with which butchers, farmers, veterinarians and other handlers come in direct contact. The undulant fever re-

sembles somewhat malaria or atypical typhoid, or even tuberculosis, and before the isolation of the specific germ, *Brucella abortus*, it was treated as one of the afore said diseases

The first proven case of brucellosis came in 1904, but only since 1918 when Miss Alice Evans of the Bureau of Animal Disease proved definitely that these germs from cattle, hogs and goats produced undulant fever in man, have the medical profession known how to cope with it. Spread of the disease is best prevented by thorough pasteurization of milk supplies and care in handling diseased animals

Uneven Color—See Butter, Cheese and Ice Cream Defects

Unhulled Peanut Oil Meal—See Feeds and Feeding

Uniparous—See Parous

United States Public Health Service Index of Homogenization Efficiency—See Homogenization Efficiency Index in Milk, Processing and Processing Equipment

Univalent—An unpaired chromosome, contrasted with bivalent

Unofficial—Not official, not being under authoritative supervision, as an unofficial test

Unpasteurized—Not pasteurized

Unregistered—Not registered, not having complied with the requirements or registration, as an unregistered animal. There fore such animals legally must be considered grades

Unripe—Not yet mature or fully ripened

Unsalted Butter—See Butter

Unsalted Cheese—See Cheese

Unsanitary—Not considered sanitary, not clean or impossible to clean

Unsaponifiable Matter—The substances in a fat which are not soluble in water and do not combine with potassium hydroxide to form soaps. In milk fat this matter is composed chiefly of sterols, carotinoids and tocopherols

Unsaturated—Capable of taking up more of an element or compound without producing any side product

See Polyunsaturated Fatty Acids

Unsex—To deprive of sex of qualities generally associated with a particular sex.

Unsound—Not in good condition as a sick cow or unsound horse.

Unsound Hoof—A defective hoof of an animal that has cracks, corns, or laminitis (an inflammation of the fleshy layers of a horse's foot).

Unsweetened Condensed Milk—See Milk, Processing and Processing Equipment.

Uperization—See Milk, Processing and Processing Equipment.

Urban—Characteristic of, or pertaining to, towns; not rural.

Urda—See Milk—Fermented.

Urea— NH_2CONH_2 (carbamide)—A non protein nitrogenous substance occurring in urine and other body fluids. It is present in milk to the extent of 120-300 mgms. per liter.

Also, a crystalline synthetic nitrogenous fertilizer prepared by reacting ammonia and carbon dioxide. It contains approximately 46% quickly soluble organic nitrogen.

Urea—Feed—See Feeds and Feeding.

Urgoutnik—See Fermented Milk.

Uri Cheese—See Cheese.

Uric Acid— $\text{C}_4\text{H}_4\text{O}_6\text{N}_2$. A non protein nitrogenous substance present in milk to the extent of 10-20 mgm. per liter.

Urine. In mammals, a fluid waste excretion of the kidneys.

Ursen (Osera)—See Cheese.

Urticaria—See Diseases in Cattle.

Use Plan—See Classification Plan.

U.S.P.—Abbreviation for United States Pharmacopoeia. See Pharmacopoeia.

U.S.P.H.S.—Abbreviation for United States Public Health Service.

U.S.P. Unit—A unit as defined by the United States Pharmacopoeia. The amount of a given drug, serum, vitamin, or the like, necessary to produce a certain effect upon a particular animal or animal tissue.

Uterus—The womb, a hollow, muscular organ in the female genital tract into which the fallopian tubes deposit the ova to be impregnated with the sperm, and where the fetus then develops. Through the cervix or neck, the uterus opens into the vagina.

Utility Grade Beef Carcasses—See Beef Carcass.

Utilization of Milk—See Milk, Utilization of.

V

Vaccination—The inoculation with a vaccine to protect against a disease by increasing the subject's resistance to that particular disease.

Vaccine—A suspension composed of living disease-producing microorganisms (especially viruses) modified in such a way as to make them incapable of producing a severe infection when used to inoculate man or animal, but at the same time able to protect against the specific disease.

Vacherin Cheese—See Cheese.

Vacreated Cream—See Milk and Cream.

Vacreator—See Milk, Processing and Processing Equipment.

Vacuum—A space free (theoretically) from any material content. Degree of vacuum is measured by vacuum gauges in several different units; namely, inches of mercury; inches of water; feet of water; pounds per square inch. Perfect vacuum at sea level, 60°F., is considered as 30 inches of mercury; 407.2 inches of water.

Vacuum Bottle Filler—A rotary milk bottle filler based upon the principle of filling bottles under a low vacuum. The incoming bottles are raised against the filling heads by means of compressed air. Immediately an air-tight seal is made and the air in the empty bottle is drawn out through vertical foam pipes. The milk is then drawn up from the feed tank into the filling heads by the constant vacuum

and is discharged into the bottles. As the bottles fill any foam is drawn off through foam pipes. At the end of the filling cycle the bottles are released and pass to the automatic capper. Because of the vacuum necessary to fill the bottles any cracked or broken bottles are not filled since no vacuum is formed.

Vacuum Gauge—A gauge making use of a column of mercury or spring device for making direct readings of the amount of vacuum in the condensing pan used in condenseries or for other vacuum equipment.

Vacuumizing and Nitrogen Packing is now extensively used in the packing of many perishable food powders, particularly milk powders. In practice it generally consists of securing as high a vacuum as possible on the cans of milk powder, then displacing this secured vacuum with a gas such as nitrogen or carbon dioxide and quickly sealing the cans.

Vacuum Pan—**Vacuum Pan (Rapid Circulation)**—**Vacuum Pump**—See **Milk Processing & Processing Equipment**.

Vagina—In female mammals a canal which leads from the uterus to the external orifice (vulva) of the genital canal in mammals.

Valence—In Chemistry that property which is measured by the number of atoms of hydrogen (or its equivalent) one atom of that element can hold in combination if negative or can displace in a reaction if positive.

In biology the degree of power which exists in varying amounts between certain bodies or substances causing them to unite or produce a specific effect upon each other said of chromosomes, *scrum*s and the like—usually in combination—as bivalence, polyvalence. See **Bivalent & Bivalent Chromosomes**.

Valine— $C_6H_{11}O_2N$ —An amino acid found in milk proteins. Casein contains about 7.2 gms and Bactoglobulin about 5.8 gms per 100 gms.

Valve (Low-side Float)—See **Refrigeration**.

Valve-vented Cans—See **Cheese**.

Vanilla—One of our most popular flavoring concentrates derived from the seed pod or bean of the *Vanilla planifolia*

plant belonging to the orchid family, which is indigenous to southeastern Mexico where it was first used by the native Aztecs to flavor their cocoa. The plant was introduced into other tropical countries where it is now cultivated quite extensively but rarely does it seem to produce the fine flavor of the bean grown in Mexico.

Vanilla Bean—The fruit of the vanilla plant and the source from which vanilla extracts are made. There are a number of common types arranged in descending order of quality: Mexican beans, Bourbon beans, South American beans, Java beans, and Tahiti beans. The least desirable of these is the Tahiti bean, which is harsh in flavor.

In order to produce *vanillin*, the principal flavoring essential, the beans are put through a sweating process. This sweating process consists of alternately drying the beans in the sun and wrapping them up at night so that they heat and ferment and is continued until the flavor and aroma develops, which takes four weeks to four months at which time the beans are sufficiently dried so that they will not mold. At the end of the curing period the pods are carefully sorted into various grades based on their quality after which they are ready to be shipped to the processing plants to be processed into extracts.

Vanilla Blends—Blends of pure vanilla extract or pure vanilla flavor with varying amounts of *vanillin* added.

Vanilla Compounds—Compounds consisting of some pure vanilla extract or pure vanilla flavor (20-30%) to which some water, alcohol, propylene glycol, *vanillin*, coumarin, caramel color, etc. may be added.

Vanilla Extract—An alcoholic extract of vanilla beans. The federal standard requires that vanilla extract contain the soluble matter from 10 grams of vanilla beans in 100 cc of extract. It is a very common flavor used in ice cream.

Vanilla Extract, Concentrated—Concentrated vanilla extract is made by distilling off a large part of the alcohol, usually in vacuum until the strength is 8 or 12 times the strength of the standard product. The so-called double strength extracts require only 3 to 4 oz to flavor 10 gallons of ice cream.

Vanilla Extract, Federal Standards—The Federal Standard for vanilla extract is "the soluble matter from at least 10 grams of beans in 100 cc of alcohol, with or without added sugar, glycerine, or coloring matter." This amounts to 15.35 oz. of beans to make a gallon of extract of 10% strength—the official minimum standard. These pure vanilla extracts are generally of such strength that 5 or 6 oz. of the extract are required to flavor 10 gallons of ice cream.

Vanilla Extract, Pure—Pure Vanilla Extract is prepared by a slow percolation process of finely cut vanilla beans in an alcohol solution (about 45% of alcohol)

Vanilla Flavor, Pure—Pure Vanilla Flavor is made by the same extraction or percolation process as pure vanilla extract except that propylene glycol is used instead of ethyl alcohol, and therefore the product cannot legally be labeled an "extract."

Vanilla Flavor Tests—See "Methods of Analysis" A.O.A.C.

Vanilla Imitations—Preparations containing no extract of vanilla beans, but consisting entirely of various combinations of chemical compounds such as vanillin, coumarin, heliotropine, amyl alcohol, aldehyde, etc. To imitate the color of natural vanilla extract, burnt sugar or caramel is usually added.

Vanilla Paste—Vanilla Paste is made by extracting the flavoring from the bean in the usual manner, but the alcohol is recovered, and the residue mixed with sugar to form a paste. Three to 5 oz. of powder or paste are usually needed to flavor 10 gallons of ice cream. The concentrated products are more economical since the alcohol can be reused.

Vanilla Powders, Imitation—Imitation vanilla powders contain sugar, vanillins, coumarin and oleoresins. In general it may be said that the amount of fortifying materials used in them must be stated on the label and they must be labeled imitation. They obviously are less expensive than natural pure vanilla flavorings.

Vanilla Powders, Pure—Pure vanilla powders are made by mixing finely cut or ground vanilla beans with sugar, or by extracting the flavoring material with alcohol, evaporating the product, and mixing the residue with sugar to absorb the flavoring material

Vanillin—The chief constituent of vanilla beans from which vanilla extract is made is present in the bean to the amount of about 2.0%, accumulating as white crystalline needles. It is found in smaller amounts in gum benzoin, Peru balsam, Tolu balsam, etc. This compound may be prepared synthetically by the oxidation of eugenol. In this form the vanillin is used in making imitation vanilla flavors and in reinforcing true vanilla extract.

Vapor Body—An upright cylindrical shell at the top end of an evaporator or vacuum pan its function is to convey the milk vapors to the condenser in making condensed and evaporated milk.

Variety—A group of animals or plants which have common ancestors related by descent, but distinguished from other similar groups only by characters which are not important enough to give the group recognition as a species or whose distinguishing characters are perpetuated only by controlled breeding. Ex. Many varieties of corn or oats and variations in controlled breeding of cattle.

Variety Hybrid—A cross with varieties of the same species; generally spoken of as mongrel

Vas Deferens—In the male animal the duct carrying the spermatozoa from the testicles to the penis.

Västertottenost—Västgötast—See Cheese.

Vat—See Milk, Processing Equipment. Also see Cheese

Veal—The meat of the calf used for human food. Generally speaking, the veal calf or vealer most in demand is one from 6 to 8 weeks of age, weighing from 140 to 160 lb. Light-colored flesh is preferred.

Vector—In biology, any agent, but usually an insect, which is a carrier of a disease-producing microorganism which it transmits from one animal or plant to another, thus spreading the disease.

Vegetable—Any herbaceous plant cultivated for food, as the cabbage, potatoes, carrots and peas. The parts of such plants prepared for market or table.

Vegetable Fats—Vegetable oils and fats of various kinds and composition are being used in increasing quantities in the making of substitute ice cream products under various trade names. The sales of these

products are as yet prohibited in a good many states but with certain restrictions their sale is being permitted in a number of states

While vegetable fats at one time played a role in adulterating butter rigid state and federal inspection have practically stamped out this practice They are of course used in increasing quantities in oleo products the sale of which has greatly increased since the addition of color has been permitted in most states

Vegetable Ivory Meal—See Feeds and Feeding

Vegetate—To grow or develop much like plants therefore to lead a more or less passive existence without much exertion of body or mind to do little but eat and grow

Vegetation—Growing as a plant does in general the total plant life or growth

Vegetative (reproduction)—Reproduction of a plant or plant part without the functioning of the sex cells Example a stolon of white clover

Velocity—Distance divided by time and expressed in feet per minute miles per hour etc When the velocity is variable and constantly increasing the rate at which it changes is called acceleration that is acceleration is the rate at which the velocity of a body changes in unit of time as the change in feet per second in one second When the motion is decreasing instead of increasing it is called retarded motion and the rate at which the motion is retarded is frequently called the deceleration

Velvet Bean—See Feeds and Feeding

Vending Machines—A special slot machine built for vending merchandise In recent years many types of vending machines have been developed for the dispensing and selling of milk and ice cream Most of these machines are sanitary easily cleaned and provide satisfactory refrigeration They are coming into general use to make milk and ice cream readily available to potential customers in schools factories and office buildings as well as in parks and public amusement places

Vendôme Cheese—See Cheese

Ventilation—The exchanging of foul air for pure air It is important in dairy

barns and dairy plants both for providing healthy conditions for workers protection of food and flavor, essentials for products being manufactured Also necessary in dairy barns for the health of animals Ventilation can best be accomplished by motor driven fans However many depend on natural ventilation which takes place through flues windows and doors For detailed instructions see Engineering Books

Ventilation (Systematic)—A system of ventilation that provides for definite air in takes and outlets Two common types are the King system and forced air system

Vernacular—The common native name of a plant or animal as distinguished from the Latin nomenclature or scientific classification

Vertebra—One of the bony more or less cartilaginous segments composing the spinal column or backbone

Vertical Curd Knives (cheese)—See Cheese

Vesicant—A drug which acts as an irritant and produces a mild inflammation of the skin with a consequent exudation of serum

Vest Pocket Test—See Dairy Tests

Vetch—See Feeds and Feeding

Veterinarian—A person who has learned how to treat diseases and injuries of animals as a veterinary doctor or surgeon

Viable—Alive and able to grow such as seeds or pollen

Vibrio Fetus—A species of bacteria which may cause abortion in cattle

Vibriosis—See Diseases in Cattle

Viet—A food supplement having the same base as Cerophyl but differing from it in that certain vitamins have been added to make the quantity of the various vitamins conform more nearly to the quantity in which they are needed by the human being It is considered very satisfactory for use as a supplement to an ordinary diet for the purpose of insuring that one receives an adequate amount of various nutrients See Cerophyl

Villi—The numerous finger like projections which give to the mucous membrane of the small intestine its velvety appearance These villi provide a larger surface

through which the nutrients of digestion may be more readily and completely absorbed by the blood vessels and lacteals which they contain.

Villiers Cheese—See Cheese.

Vinegar—An acid liquid used as a condiment; an impure dilute acetic acid made by fermentation of cides, malt, wine and other fruit juices.

Vioosterol—A trade name for irradiated ergosterol which is prepared commercially from yeast and is sold on the market in standardized units. It is used to increase the amount of vitamin D in milk.

A concentrated commercial form of vitamin D (Calciferol) in an inert oil.

Virgin Soil—Soil which has not previously been plowed or disturbed from its natural state.

Virulence—The ability of a virus or other microorganism to produce disease. See book on Livestock Diseases.

Virus—An organism of the order *Virales*; A parasitic microorganism, smaller than most bacteria, and capable of multiplication only within a susceptible host cell where it may cause a specific disease. Formerly called filtrable virus (the organism is small enough to pass through the finest pores of a porcelain filter).

Virus Disease—Any disease caused by a virus, as mosaic, leaf roll, curly top in plants, foot and mouth disease, hog cholera, sleeping sickness, etc. in animals.

Viscera—The internal organs, located in the cavities of the body or trunk, as the heart, lungs, liver, stomach and intestines.

Viscogen—Sucrate of lime. A substance which enhances the whipping quality of cream. It is prepared by mixing a concentrated solution of cane sugar with freshly slaked lime. After the mixture has stood for some time, the clear liquid, Viscogen, is poured off. One part of Viscogen in 100-150 parts of milk or cream will give the desired effect. It reunites into clusters the fat globules which were broken up by heat. Sometimes used in neutralizing high acid cream, but its neutralizing strength is too low to make it of much value. Most often used to reduce acid in slightly sour cream and restore sugar sweetness previously lost by conversion of lactose into acid. Its use is not legal in some states.

Viscolization—Viscolizer—See Milk, Processing and Processing Equipment.
Viscosimeter or Viscometer—An instrument for measuring viscosity of ice cream mix, sweetened condensed milk, evaporated milk and other liquid products.

Viscosity—The resistance of a fluid to shear or flow, i.e., the internal friction within a fluid. Viscosity is expressed in terms of a unit called the "poise" which is defined as the force in dynes which when exerted on unit area between two parallel planes of liquid 1 sq. cm. in area and 1 cm. apart causes one to move at a rate 1 cm/sec faster than the other. Water has a viscosity of 1.0050 centipoises (1 centipoise = 0.01 poise) at 20°C. (68°F.).

The viscosity of skim milk is about 1.5 c.p. at 20°C. (68°F.) that of whole milk 1.9 to 2.8 depending on the fat content.

In evaporated milk the viscosity is the consistency as measured by Mojonnier-Doolittle units at 75°F. conversion to centipoises using formula:

$$MU = \frac{C - 10}{1.9}$$

MU refers to Mojonnier-Doolittle units or degree and C pertains to centipoise value.

Vitafer—Similar to sanotogen but contains more glycerophosphate and less casein. See Sanotogen.

Vitality Test—See Dairy Tests.

Vitamins—A group of very potent organic substances which occur in minute quantities in natural foodstuffs, which must be supplied in the diet of animals or may be synthesized in animals from essential dietary or metabolic precursors, and which exert specific effects in the control and coordination of chemical reactions in the animal body.

Ascorbic Acid— $C_6H_8O_6$. A water soluble vitamin (Vitamin C). Both ascorbic acid and its first oxidation product, dehydroascorbic acid function as the vitamin. Milk as secreted contains about 20 mg. of ascorbic acid per liter but it is rapidly oxidized to the dehydroascorbic acid by air. The latter is destroyed by heating so that pasteurized milk may have little vitamin C, unless added after pasteurization.

It is found abundantly in citrus fruits, tomatoes, cabbage and other raw green leafy vegetables and forage plants.

It is also artificially produced as a crystalline colorless compound with mild citric acid taste, which oxidizes easily especially in the presence of moist heat. It is essential in the formation of collagen. Connective tissues and tissues of the walls of the capillary blood vessels are weakened by a lack of ascorbic acid. Severe deficiency results in scurvy, capillary bleeding into skin and muscle tissue and bloody diarrhea.

Biotin— $C_{10}H_{16}O_3N_2S$ —A water soluble vitamin present in milk to the extent of about 50 mg per liter.

Formerly known as Vitamin H or Factor H of the B complex. It is one of the most recently discovered vitamins known to be essential in human nutrition. How it functions is not yet established. Deficiency of biotin in the diet of rats fed a ration high in a raw egg white produced "egg white injury," a condition characterized by severe dermatitis, skin hemorrhages, edema, nervous disturbance, anemia, and complete loss of hair. Cooked egg white produced no injury. In humans, some of the similar conditions (except loss of hair) have been reported which were cured by addition of biotin. Important sources are eggs, liver, kidney, yeast, fresh vegetables, some fruits and milk.

Calciferol—Vitamin D_2 —A derivative of ergosterol produced by irradiation and is the Vitamin D in irradiated yeast, viosterol, some fish oils and other medicinal preparations.

Choline—A compound which functions in the animal organism as a source of labile methyl groups, and in a number of species as a lipotropic agent by aiding the conversion of neutral fats to phospholipides in the liver. Choline occurs in the body as a constituent of lecithin or as acetyl choline. Its classification as one of the vitamins of the Vitamin B-complex is not universally accepted. A deficiency of choline prevents normal functioning of liver and kidney.

Liver is an excellent source of choline. Good sources are meat, eggs, cereals and certain vegetables.

Citrin—Vitamin P—A substance prepared from Hungarian red pepper, and from orange and lemon peel. It is said to be distinct from ascorbic acid, and useful in the treatment of obstinate capillary bleeding which did not yield to treatment with large doses of ascorbic

acid. It is also called hesperidin. Recent work indicates that the capillary fragility factor may be of multiple nature.

Fat-Soluble Vitamin—A vitamin which is soluble in fats or oils. Vitamins A, D, E, and K are fat soluble, therefore they are extracted with fats or oils.

Folic Acid ($C_{19}H_{19}N_7O_6$)—A water soluble vitamin. It is also called pteroyl glutamic acid. Milk contains about 1 mg of folic acid per liter. Folic acid has been of therapeutic value in the treatment of macrocytic anemia, leucopenia, and thrombopenia. Green leafy vegetables are excellent sources of this vitamin.

Inositol—($C_6H_{12}O_6$) A water soluble vitamin. Milk is a good source, containing about 180 mgms of inositol per liter. Other good sources are fresh fruits and many vegetables and wheat germ. This compound has been shown to be a requirement in the diet of animals for proper nutrition and growth. It occurs in foods in the free form and as phytin. Its significance in human nutrition is not established, although it may have some lipotropic effect in the liver.

"Koagulation" Vitamin—Called Vitamin K. It appears to be essential for the normal coagulation of blood. Leafy vegetables, cereals, pork liver fat, rice bran, soybean oil, and milk and its products are sources of this vitamin.

Niacin or Nicotinic Acid—An important water soluble vitamin present in milk to the extent of 2 to 1.2 mg per liter. One of the B vitamins. It is known as the pellagra prevention (P.P.) factor and appears as a white, crystalline, odorless compound soluble in hot water and alcohol. Widely distributed in nature, it may be obtained from liver, milk, lean meat, rice, green leafy vegetables, green peas, yeast, tomatoes, etc. It is also produced synthetically. Severe niacin deficiency in the diet may result in pellagra, a disease characterized by skin lesions, digestive and nervous disorders, inertia and melancholia. It is essential to normal nutrition and good health.

Pantothenic Acid— $C_8H_{17}O_6N$. An important water soluble vitamin present in milk to the extent of about 3 mg per liter.

A part of the B₅ complex formerly called "filtrate factor" and chick anti-dermatitis factor. It is now known also

to be an essential factor in human nutrition, although its definite function is not yet clearly established. It seems to be closely associated with riboflavin. It is widely distributed in living tissues of all kinds. Richest source is liver; brewer's yeast, egg-yolk, peanuts, meats, cereals and milk are good sources. It is available as a calcium salt, occurring in fine, dense, white odorless crystals, with slightly bitter taste.

Para-amino Benzoic Acid—A compound classified in the Vitamin B-complex that exhibits growth promoting effects for chicks and many bacteria. It may function as a precursor of folic acid. It is found in appreciable amounts in yeast, liver, wheat germ, etc.

Pyridoxine—A water soluble vitamin (Vitamin B₆) present in milk to the extent of about 0.7 mg. per liter.

There are several metabolically active forms of Vitamin B₆ (pyridoxine, pyridoxal, pyridoxamine, and B₆ pyracin). These compounds function biologically as constituents of enzyme systems which are concerned with protein metabolism. They may also function in fat metabolism.

Deficiency of Vitamin B₆ is characterized in some species by the development of dermatitis, anemia, and impaired growth.

Cereals, fish and meats are good sources of Vitamin B₆, and vegetables and milk are fair sources.

Riboflavin—Riboflavin, formerly called Vitamin G, one of the B-vitamins, is an odorless, crystalline compound, orange-yellow in color, and showing a yellow-green fluorescence in water solution. It is quite heat stable, especially in acid media, but deteriorates rapidly when exposed to light. A deficiency retards growth in young animals, produces dermatitis, affecting eyes, skin and hair; causes inflammation of lips, etc., and impairment of nervous system. Riboflavin is widely distributed in both plant and animal foods. Rich sources of it are milk, liver, meat, eggs, cheese, peanuts, spinach, fresh peas, etc.

It is present in milk to the extent of 1.5 to 2.0 mgms. per liter.

Thiamin—Thiamin or Vitamin B₁, known as the anti-beriberi and anti-neuritic vitamin, is a water soluble, white, crystalline compound of yeasty odor and salty nutlike flavor. It is not

easily destroyed by oxidation, nor by heat if it is in acid solution, but deteriorates rapidly in alkaline or neutral media. Thiamin is essential for complete carbohydrate metabolism; is a factor in prevention and cure of beriberi and polyneuritis, stimulates appetite, promotes good muscular tone in the intestinal tract and general good health. Rich sources of thiamin are dry brewers' yeast hucks and germs of grain such as wheat, barley, oats, rice, etc., and in whole grain or enriched food products made from grains. It is found in milk to the extent of about 0.4 mg. per liter and in fruits and is also produced synthetically.

Vitamin A—C₄₀H₅₆O. A fat soluble vitamin produced by oxidation of such carotenoids as B-Carotene. It is an important factor in maintaining the integrity of epithelial (skin) tissue and in preventing night blindness.

Milk contains 0.1-0.5 mgms. of Vitamin A per liter. A severe deficiency of Vitamin A results in xerophthalmia of the eyes, retarded growth, interference with regeneration of visual purple in the eye, thus causing night blindness.

Reliable sources of Vitamin A are foods of animal origin, including butterfat and all dairy products containing butterfat, egg yolk and fish liver oils. Green and yellow vegetables and fruit are excellent sources of B-carotene or Pro Vitamin A.

According to current literature, the normal daily requirement of Vitamin A for adults is 5,000 I.U.; lactation period 8,000 I.U.; children up to 12 yrs. 1,500 to 4,500 I.U.; youths 15 to 20, 5,000 to 6,000 I.U.

Vitamin B₁₂—C₂₀H₃₀O₆N₂S. A water soluble vitamin present in milk to the extent of about 50 mg. per liter. The function of Vitamin B₁₂ is not yet known. The severest form of Vitamin B₁₂ deficiency in man is pernicious anemia.

Vitamin C—See Ascorbic acid and Dehydroascorbic acid.

Vitamin D—A group of fat soluble substances including calciferol and activated (irradiated) 7-dehydrocholesterol which function as antirachitic factors. Since the content of Vitamin D in normal milk is very low, much milk is enriched by adding preformed Vitamin D (usually to 400 International Units per

quart) (1 International Unit = 0.025 micrograms of Calciferol or equivalent) It is popularly called the Sunshine Vitamin because it is normally produced in the body by the process of irradiation i.e. the direct action of the ultraviolet rays of the sun upon the Provitamin D (a form of cholesterol) in the skin and hair and in the fur and feathers of birds and animals It is very essential for proper growth and for the formation of sound tooth and bone structure in young children and all young animals for without it the body cannot utilize the calcium and phosphorus supplied in the diet and the disease called rickets develops Vitamin D not only prevents rickets but is effective as a cure and is widely used in the form of fish liver oil and irradiated products as Viosterol (irradiated ergosterol) and Vitamin D milk to supplement the natural supply especially in northern winter climates where efficient sunshine is limited Richest sources of this fat soluble vitamin are the fish liver oils such as halibut cod tuna sword fish and others It is also found in limited supply in the flesh of most food fish and in smaller amounts in egg yolk and milk fat

Vitamin E or Alpha tocopherol (the Tocopherols)—The anti-sterility vitamin which is a fat-soluble crystalline compound derived from the oils of grains and seed such as wheat germ cotton seed palm rice and also from whole

grain cereals Lettuce and other greens are good sources it is also found in liver pancreas heart tissues and milk and is produced artificially Deficiency of vitamin E in rats leads to abortion or to resorption of the fetus in females and to sterility in males In humans it is not proven that lack of Vitamin E affects reproduction It has been proven that Vitamin E is essential in muscle nutrition in many species of animals both fowls and mammals

Vitamin K—The antihemorrhagic vitamin which is a fat soluble thermostable compound essential for the formation of prothrombin a substance vital for normal clotting or coagulation of the blood It is used to prevent severe hemorrhage in many surgical operations especially those connected with obstructive jaundice and other liver diseases It is also used to prevent fatal bleeding in newborn infants The proper absorption and utilization of natural Vitamin K requires the presence of normal bile in the intestinal tract Small quantities of Vitamin K probably are stored in the liver All green plant material is rich in Vitamin K

A synthetic compound 2 methyl 1 4 naphthoquinone (menadione) has higher anti-hemorrhagic potency than the natural vitamin

Vitamins, Standards of Activity—See International Units (I U) Table in Reference Section P 319

VITAMIN SUMMARY*

Name	Fat Soluble Vitamins Function	Source
Vitamin A (Carotene of plant origin is the precursor of Vitamin A in animal body)	Prevents Xerophthalmia constituent of visual purple of the retina necessary for maintenance of normal epithelial cells essential for normal reproduction	Of animal origin liver eggs butter Of plant origin green and yellow vegetables and fruits
Vitamin D (Calciferol)	Necessary for the formation of normal bone	Only very small amounts present in natural foods Usual source is fish liver oils a fortified or irradiated food
Vitamin E (Tocopherols)	Necessary for normal reproduction in animals	Cereal germs egg yolk legumes, nuts leafy vegetables vegetable oils
Vitamin K (Menadione and derivatives)	Essential for synthesis of prothrombin and normal blood clotting	Green leaves alfalfa casein and certain vegetable oils

* Courtesy of Mrs. A. de W. W. Phillips, University of Massachusetts, Amherst

VITAMIN SUMMARY—(Continued)

Water Soluble Vitamins		
Name	Function	Source
Ascorbic Acid (Vitamin C)	Prevents scurvy; essential in proper formation of collagen	Citrus fruits, other fresh fruit and vegetables.
Thiamin (Vitamin B ₁)	Prevents beriberi.	Wheat germ, dry yeast. Widely distributed in animal and vegetable foods but not present in abundance; fortified bread and cereals.
Riboflavin (Vitamin B ₂ , G)	Functions as part of a Coenzyme system that is involved in the release of energy from foods. Important in maintenance of normal health.	Milk, liver, eggs, green leafy vegetables.
Niacin (Nicotinic Acid)	Prevents pellagra; functions in enzyme systems	Meat, poultry, fish.
Pantothenic Acid	Essential in maintenance of normal skin, growth, and development of central nervous system.	Meat, eggs, vegetables.
Pyridoxine (Vitamin B ₆)	Important in metabolism of fats and amino acids.	Yeast, wheat germ.
Biotin	Function not established, probably function is form of coenzyme.	Eggs, liver, legumes, milk.
Folic Acid	Used therapeutically in treatment of pernicious anemia.	Green leafy vegetables.
Para amino benzoic acid	Promotes normal growth in chickens, may serve as precursor of folic acid	Yeast, liver, wheat germ.
Vitamin B ₁₂	Essential for normal development of red blood cells.	Liver, kidney, milk, muscle meats, fish.
Inositol	Important for proper nutrition and growth of animals.	Fresh fruits, vegetables, wheat germ.
Choline	Important in normal functioning of liver and kidneys.	Liver, meat, eggs, cereals and certain vegetables.
"Grass Juice Factor"	An unknown vitamin which has proved necessary for the growth of guinea pigs.	Fresh grass.

Vitamins in Cheese (per lb.)

	Cheddar 7920	Cream 10050	Cottage 150.
Vit. A I.U. 8	2.29	0.65	1.32
Riboflavin mgs.	0.20	0.06	0.08
Thiamin mgs.	0.9	0.3	0.5
Niacin mgs.	0.0	0.0	0.0
Ascorbic Acid			
Pantothenic acid } High in Camembert and Blue as organisms from smear ripened			
Nicotinic acid } cheese synthesize considerable amounts of the B. vitamins.			
Biotin			

Vitamin Content of Ice Cream—See Ice Cream.

Vitamin D Milk—See Milk and Cream.

Vitamins—Fat Soluble and Water Soluble—See Vitamin Summary.

Vitex—A vitamin D concentrate added to milk. It is an emulsion of the natural vitamin D of Cod Liver Oil in cream. It contains none of the oil or fatty acids of the original Cod Liver Oil nor any other fat or oil foreign to milk.

Vitrification—The rapid solidification of a liquid or tissue into an amorphous solid without rearrangement of molecules to form crystals.

Vize—Vlasic Cheese—See Cheese.

Vocational Agriculture—Refers to an educational program on the secondary school level to fit persons for useful and profitable employment in agriculture and allied occupations. It is designed specifically to meet the needs of persons over 14 years of age who desire practical agricultural courses as preparation for work on the farm, and who, for one reason or another, do not plan to take higher educational work.

Vogt Freezer—See Ice Cream.

Vogt Method—See Milk, Buttermilk.

Void Cheese—See Cheese.

Volatile—A term used to describe a substance which evaporates readily at ordinary temperatures upon exposure in open vessels.

Volatilization of Nitrogen—Loss of nitrogen by its conversion into the ammonia form. A source of loss especially from manures.

Volhard Method—See Dairy Tests.

Volt—That potential difference against which one joule of work is done in the transfer of one coulomb. One volt is equivalent to 10^8 electromagnetic units of potential.

The international volt is the electrical potential which when steadily applied to a conductor whose resistance is one international ohm will cause a current of one international ampere to flow. The international volt = 1.00033 absolute volts.

Volume—Unit of the cubic centimeter, the volume of a cube whose edges are one centimeter in length. Other units of volume are derived in a similar manner.

Vorarlberg Cheese—See Cheese.

Vulva—The vestibule, or duct common to both genital and urinary tracts leading to the body surface and found in most female mammals.

W

Walker Test for Casein—See Dairy Tests.

Warble Fly—Any of certain flies whose larvae live under the skin of cattle and other mammals.

Warbles—See Diseases in Cattle.

Warm-cured, (forced-cured, fast-cured, shelf cured)—See Cheese.

Warts—Diseases in Cattle.

Wash Water (Butter)—Washing Butter—See Butter.

Washed Curd Cheddar—Washed Curd Method—Washing—See Cheese.

Washer, Three-compartment—A device for washing, rinsing and steaming milk

bottles. The first compartment contains hot washing solution forced into bottles through jets by means of a pump. The second compartment contains a hot-water rinse solution and the third has jets for steaming the bottles.

Washing Powders, Acidity of—The acidity of a solution is a measure of the amount of acid present. It may be due to either a weak or a strong acid or both. It is a quantity measurement and may be expressed in percentage, parts per million, in pounds or grains per gallon. *Acids* are chemicals which release an excess of hydrogen ions in a solution giving a pH of less than 7. *Strong Acids* release a high concentration of hydrogen ions in a solution giving a pH very low on the scale: *Hydrochloric and sulfuric acid. Weak Acids*

release a moderate to low concentration of hydrogen ions in a solution giving a pH which is moderate, but still below 7: Ex. Acetic, Hydroxyacetic and Lactic acid.

Washing Powders, Alkalinity of—The alkalinity of a solution is a measure of the amount of alkali present. It may be due either to a weak or a strong alkali or both. It is a quantity measurement and may be expressed in percentage, parts per million, in pounds or grains per gallon. Alkalies are chemicals which release an excess of hydroxyl ions in a solution giving a pH of more than 7. Strong alkalies release high concentrations of hydroxyl ion in a solution giving a very high pH: Ex. Caustic soda. Weak Alkalies release moderate to low concentrations of hydroxyl ions giving moderate pH values, but still above 7. Ex. Sodium bicarbonate.

Washing Powders (Cleaning Agents)—

Washing Powders for dairy purposes should contain no soap because this ingredient leaves a surface film which is difficult to rinse away. Free alkalis, as sodium hydroxide and caustic, should not be used on metallic surfaces if corrosion is to be prevented. Sodium carbonate (washing soda), and tri-sodium phosphate are satisfactory types of cleaning agents. The effectiveness of these materials is improved by a small amount of so-called "wetting agents" (i.e., materials like sulfonated alcohols sold under various trade names like "drefit," "syntex beads" etc.). Water containing appreciable amounts of calcium or magnesium is described as "hard" water. The use of such water is a contributing cause of a deposit known as "milk-stone" on the surface of the equipment. This can be avoided by adding a "water-softening" agent (such as pyrophosphate or meta-silicate) to the washing compound, but these are not necessary when "soft" water is used. A very satisfactory cleaning agent for use in hard water may be prepared by thoroughly mixing 100 lb. trisodium phosphate with 20 lb. tetrasodium pyrophosphate and 2 lb. syntex beads. Preparing these mixtures is somewhat troublesome even though it frequently is more economical.

Where soft water is available, excellent results are obtained from a mixture of 40 lb. trisodium phosphate, with 60 lb. sodium carbonate and 2 lb. syntex beads. There are many similar mixtures available under trade names, and these give equally good results.

Washing Powders (Constituents of)—Sodium Carbonate, Tri-Sodium Phosphate, Hypochlorites, Silicates, Resinates & Gums, Sodium Hydroxide, Soap, Sulfates, Sodium Zincate, Grit, Borax, Aluminate.

Washing Powder—(An old economical mixture still liked by some)

Sodium carbonate (anhydrous)	60%
Tri-sodium phosphate (12 H ₂ O)	40%
Total alkali as NaOH about	58%
Sodium hydroxide	None (except what may occur free in the carbonate).

Soap None

It may be safe to say that the best powder for dairy cleansing should have no soap and no free caustic for hand washing, and little free caustic for machine washing. The above combination has been found to give good results in all laboratory tests as well as in all plant tests. This percentage composition could be obtained from various mixtures of the commercial chemical products which should be analyzed and mixed accordingly.

Commercial tri-sodium phosphate ordinarily contains 12 molecules of water. For machine washing it may be deemed advisable to increase the total alkali content by the addition of a little sodium hydroxide

Washing Powders (Wetting Agents)—Also called synthetic detergents, surface active agents and "wetters." In general wetting agents exhibit a variety of properties, the most important is that of "wetting." They are also good emulsifiers, dispersion and suspension agents and good rinsers. There are three general types of these materials: —anionic, negatively charged ions (acidic); cationic, positively charged ions (alkaline); and non ionic, carrying no electric charge (neither acid nor alkaline).

Waste (Dairy)—In the dairy industry, waste refers usually to by-products such as buttermilk and whey, especially whey, which are not put to good use but are allowed to run into the drains and sewers of creameries and cheese factories. Buttermilk and whey are both good food or feed products and should all be used.

Waste Disposal Systems—There are many different systems for taking care of waste from cheese and butter factories. Among them are the following:

Trickle Filter, Contact aerators, Sand filters, Activated Sludge, Dilution, Contact beds

For detailed information, see engineering books on sewage disposal

Waste-land—Uncultivated especially barren land generally not capable of producing food or feed

Water (H_2O)—The pure clear liquid whose constituents are hydrogen and oxygen that is so necessary for the life processes carried on by animals and plants

An ample supply of good pure water is one of the prime necessities for the dairyman, both for dairy cattle and for the various processes in the dairy plant. It must be free from undestructible bacteria and odors and taste and as far as possible free from minerals that produce hard scales. See good book on Water Supplies

Water Buffalo (Carabao)—One of the two principal types of dairy animals of south east Asia and other tropical regions. Its long horns point backward over the neck, or in some breeds curve and curl like rams' horns. Because of its thick, hairless skin which has no sweat glands it does not easily tolerate the mid day heat and seeks the cooling water of the swamps and ponds, hence, its name Water Buffalo. The domesticated animals of which there are several breeds are protected by open sheds or shelters or are driven to the water holes for mid day comfort

In India and elsewhere, the males are used as work (draft) animals, the cows produce a pure white milk rich in butterfat (averaging about 7%) and also high in sugar and protein in comparison with U. S. cattle, but less in quantity. In India, dairying as a business is progressing and more fluid milk is used in the diet but a large percentage is made into Ghee, the highly prized and comparatively high priced clarified butter, or butter oil. In these countries the water buffalo is also used as a beef animal except by the Hindus of India

Water Dilution Method—See Milk Processing & Processing Equipment

Water Drinking Facilities for Dairy Cattle may be a tank in the lot or pasture, a float pool watering device in the yard or a waterer in front of cows in ranchhouse. It is important that cows have an adequate

supply of good wholesome water, and that the plumbing in all watering devices be installed so as to prevent back siphonage

Water Hardness—Composed of the mineral constituents of water which form insoluble products when mixed with soap. These are principally calcium, magnesium and iron compounds which are found in most waters. *Temporary Hardness* is that part of the total water hardness which precipitates out of the water on heating. It is composed of the bicarbonate salts of the calcium, magnesium and iron in the water. *Permanent Hardness* is that part of the total water hardness which will not precipitate on heating. It is composed of the salts of calcium magnesium and iron dissolved in water other than the bicarbonate salts such as the sulfates or chlorides

Waterlogged—An unfavorable condition of soil for most crops, caused by too slow percolation of water after a rain, so that free water remains in the soil

Water Pack—See Cheese

Water Requirement of Plants—The amount of water required for a plant to produce a pound of dry matter

Watershed—The area contributing to the supply of a river stream or lake

Water-sick—A more or less local term referring to waterlogged land that for the time being cannot be cultivated because of its saturated condition

Water-slaked Lime—Slaked or hydrated lime

Water Softening—The removal or inactivation of the hardness of water. Orthophosphates, such as trisodium phosphate, and alkalies soften water by precipitating the hardness. The complex or polyphosphates soften water by sequestering the hardness. The chelation agents soften water by forming soluble compounds called chelates. Water softening minerals soften water by exchanging the hardness constituents for compounds which are not hardness constituents. *Dissolving* is a chemical reaction which produces water soluble products from water insoluble soil. *Dispersion* or *Defeculation* is the action of breaking up aggregates or flocs into individual particles. These many small particles then are more easily suspended and flushed off equipment.

Water-Soluble Vitamin—See Vitamins.

Water Supply—The ideal water supply for the milk or food processing plant should meet the following requirements: 1. Free from organisms which cause disease; 2. Sparkling, clear and colorless in appearance; 3. Pleasant tasting, free from odors, and cool; 4. Soft; 5. Neither scale forming nor corrosive; 6. Free from objectionable gases, such as hydrogen sulfide, and objectionable minerals, such as iron and manganese; 7. Low in cost.

Since a water meeting all these requirements is never available in quantity, the best water available must be chosen and treated to suit the requirements of the individual plant.

Water Table—The point in a soil or underlying material saturated with water or at which free water may be found.

Watt—The power of an electric current of one ampere flowing under a pressure of one volt, and approximately 1/746 part of one horse-power.

Wattle—A livestock identification mark in which the skin on the dewlap or other part of the body is slit.

Wavy Butter—See Butter Defects.

Wavy—Uneven—See Cheese Defects (Color Cheddar).

Wax—(Paraffin)—See Cheese.

W Chromosome—A sex chromosome found in birds and certain plants. The female of this group is the heterogametic sex and has one Z and one W chromosome, whereas the male is homogametic and has two Z chromosomes. The WZ type of heredity is used to differentiate from the XY type of animals.

Weak Body—See Butter and Cheese Defects.

Weanling—An animal newly weaned or broken from the nursing habit.

Weather—The general atmospheric condition at any definite time, including temperature, precipitation, cloud and sunshine, humidity and winds. It varies from day to day. In general the weather and its variations may be said to be due to the motion of the earth's lower atmosphere.

To expose to the air; to disintegrate or to weather away.

Weed—A plant more or less harmful to growing crops. One which is generally useless or unsightly in appearance.

Weed Flavour—See Milk and Cream Defects.

Weeping in Cheesemaking—See Cheese Defects.

Weevil—A snout beetle having an elongated head which is usually curved downward, to form a kind of snout with the jaws at the tip. The larvae live in many substances as nuts, fruits, grains, trees, and other plants.

Weigh Can or Tanks—A large metal container setting on or attached to scales and designed primarily for the accurate and convenient weighing of milk or cream in the receiving room. Weigh cans may be of either high or low style, the latter requiring a pit for installation. Double compartment weigh cans are generally used in the larger milk plants.

Weight Control—See Ice Cream.

Weights of Cows, How to Estimate—The approximate weight of a cow can be estimated by measuring the heart girth of the animal and converting the inches of heart girth to pounds by the use of a conversion table. This table is often put on the tape measure and the weight then estimated. Many feed dealers and supply houses carry these tapes.

Weights & Measures—See Reference Section. P. 324.

Weir—A dam, used to control the flow of water in a river or stream to stop and raise the water, for the purpose of conducting it to a mill, forming a fishpond, irrigation channel, or ditch, etc.

Weisslacker Cheese—See Cheese.

Well-bred—A term used to denote good breeding, with particular reference to an animal.

Wensleydale Cheese—Werber (Elbinger, Niederrunkäse)—See Cheese.

Werner-Schmidt Method—See Dairy Tests.

West Friesian Cheese—See Cheese.

West Highland—An old breed of horned beef cattle of minor importance until recently when improvements in breeding were begun; native home Scotland; color,

red and black, weight 900 to 1200 lb
Sometimes called Highland

Western Rye—See Feeds and Feeding

Westerns—In marketing a term generally applied to animals from the western range states of the United States

Westphal Balance—An apparatus used in the determination of the specific gravity of milk. It consists of a beam balanced on a knife edge with a sinker suspended from one end which is immersed in the liquid to be tested. This sinker is counterpoised by a brass weight at the other end of the beam. Readings are made after the weights on the matched beam are adjusted.

Westphalia Cheese—See Cheese

Wet Milking—Milking a cow while the hands are wet with milk. This method is definitely unsanitary.

Wet Mix—Applied to a mixture of nonfat dry milk, whey and other ingredients added as a slurry to cheese foods or spreads.

Wet Pack Cabinet—See Ice Cream

Wet Rendering Method—See Feeds and Feeding

Wet Steam—Steam which carries small water droplets along with it.

Wetting—The action of water in contacting all surfaces of soil or equipment. This action is aided by surface tension. Wetting lowers the surface tension of water by breaking the lines of force, thus greatly increasing the ability of water to contact all surfaces. **Wetting Power** is the ability to make a contact with the surface to be cleaned. In order to have good wetting power it is necessary to have good penetration of the liquid into porous materials through cracks, pinholes or small channels.

Wetting Agents—See Washing Powders

Wet Vacuum Spray Condenser—See Milk Processing and Processing Equipment

"What We Have Learned about Bulk Tanks"—See Handbook Section, P 112

Wheat—See Feeds and Feeding

Wheat Belt—(Wheat States)—An agricultural region in which more land is de-

voted to the production of wheat than to any other one crop. In the United States there is a winter wheat belt southwest of the great corn belt and a spring wheat belt northwest of the corn belt. The spring wheat belt extends into Canada.

Wheat Bran—**Wheat Brown Shorts**—**Wheat By Products**—**Wheat Flour Middlings**—**Wheat Gray Shorts**—**Wheat Mixed Feed**—**Wheat Red Dog Flour**—See Feeds and Feeding

Wheat Rust—A fungus group of diseases of wheat and other grasses including stem rust, leaf or crown rust and others.

Wheat Scab—A destructive disease of wheat caused by a sac fungus characterized by head blight. The same fungus also attacks barley and corn.

Wheat Standard Middlings—**Wheat White Shorts**—See Feeds and Feeding

Wheat Cheese—See Cheese

Whey—The serum of watery fluid which is separated from the curd after milk is coagulated for cheesemaking. It contains the milk sugar and minor amounts of fat and other soluble constituents of the milk. Because of its food value, large quantities of it are now used in candies and special cheese products, large quantities are also used in dry and concentrated form to be mixed with food and feeds, used in many human foods and as feed for poultry and livestock. Much of the whey is also condensed and spray dried by the roller process. See Cheese. For details see Hunziker's book on Condensed Milk and Milk Powder.

Whey Beverages—Some of the following whey drinks have been developed: wines, carbonated beverages, buttermilk substitute, whey fruit flavored drink and whey tomato drink.

Whey Bran Feed—See Feeds and Feeding

Whey Butter—See Butter

Whey Cheese—See Cheese

Whey, Condensed—A product made by concentrating whey in a vacuum pan. The product has excellent nutritional properties because it is high in milk sugar and protein and in riboflavin which also is important nutritionally. It is used mostly

WHEY CREAM BUTTER

for cooking purposes. Approximate composition is as follows: Water 48.1%, Protein 7.5, Fat 2.4, Lactose 21.4, Ash 5.6. See *Mysost* and *Primost Cheeses*.

Whey Cream Butter—See *Whey Butter*

Whey Disposal—Unless whey is being made into some commercial product or used in animal feeding by the farmers, it is a liability to the cheese factory. Whey has a high biological oxygen demand and cannot be dumped into streams without causing pollution problems. Whey should not be dumped into an old quarry as it may seep through to the underground water supply.

Whey can be treated by a septic tank system, a trickle filter or an activated sludge system and in other ways.

Whey, Dried—Whey from which most of the moisture has been removed. There are no legal requirements governing its composition. May be either in powdered form or pressed into bricks.

Whey Drying, Simmons Process—An economical method of making a stable whey powder on a small scale as well as by volume production. Under this patent the whey is precondensed under vacuum to about 70% solids, then cooled and seeded with alpha hydrate crystals. After crystallization it is broken up into small size particles and drying is completed.

Whey Fat—The fat remaining in the whey during cheesemaking. This may run as high as .7% plus of the butterfat of milk. This also is good butterfat and can be separated from the whey and sold for making butter or ice cream. Separated whey will contain about 0.1% fat.

Whey Fat Test—See *Dairy Tests*.

Wheying Off in Buttermilk—Makers of cultured buttermilk frequently have trouble in wheying off, that is, a noticeable separation of whey. This action can be retarded by high acidity and low storage temperature.

The time and temperature of pasteurization are known to have a noticeable effect upon the viscosity of the product and the separation of the whey, high temperatures being less conducive.

Whey Off—See *Cheese*.

Whey Protein Powder, Soluble

Analysis:	Mineral			
	Water	Protein	Lactose	Matter
	%	%	%	%
From Swiss Cheese				
Whey				
Maximum	5.05	41.46	52.00	18.15
Minimum	1.62	32.45	57.20	12.45
Average	3.23	38.02	43.02	16.38
From Roquefort				
Cheese Whey	3.30	24.70	46.50	25.50

Whey Protein (Serum Protein)—The mixture of proteins remaining in whey or serum after precipitation of the casein with rennet or acid coagulation. Essentially the proteins of milk other than casein. See *Milk-Serum Proteins*.

Whey Separator—A centrifuge which removes most of the fat from whey. See *Whey Fat*

Whey Silage—See *Silage*

Whey Starter—A culture which is made from whey instead of milk or skim milk. Whey starters were formerly used to a large extent in Swiss Cheese operations. Often this starter was just a sample of whey incubated from the previous day's make

Whey Taint—See *Cheese Defects (Flavor)*.

Whey Tank—1. A large tank often made of wood and situated outside the factory, in which whey is stored prior to removal by farmers. 2. An open vat inside the factory where whey is held prior to separation.

Whey—Uses of—Whey butter, whey drinks, soups, protein hydrolyzates, cheese, processed cheese foods, processed cheese spreads, animal feed, bakery products, candy, infant foods, hydrolyzed lactose syrup, pills, penicillin, riboflavin concentrates, butyl alcohol, acetone, spirit vinegar, food acidulant, resins, coatings, tanning, acrylic plastics.

Whipped Butter—Whipped Butter Spread—See *Butter*.

Whipping Aids—Substances added to influence the whipping quality of cream. If cream has been properly processed and has sufficient fat, whipping aids are usually unnecessary when the correct whipping procedure is followed. Viscogen, sodium alginate, gelaun, nonfat dry milks, and

other substances will influence the time required to whip cream and also the stability of the whipped product. The addition of such materials is illegal in many cities and states. Formerly called thickeners.

Whipping Cream—See Milk and Cream

White Cheese—See Cheese

White Clover—White Crop—White Dutch Clover—White Middlings—See Feeds and Feeding

White Scours—See Diseases in Cattle

White Specks—White Whey—See Cheese Defects (Body Cheddar)

Whitewash, Formula for—The following formula has been recommended by the United States Department of Agriculture.

Take a half bushel of unslaked lime, slake it with boiling water, cover during the process to keep in steam. Strain the liquid through a fine sieve or strainer, and add to it a peck of salt previously dissolved in warm water, 3 lb of ground rice boiled to a thin paste and stirred in while hot, $\frac{1}{4}$ lb of Spanish whiting, and 1 lb of clean glue previously dissolved by soaking in cold water, and then hang over a slow fire in a small pot hung in a larger one filled with water. Add 5 gallons of hot water to the mixture, stir well let it stand for a few days covered from dirt. It should be applied hot, for which purpose it can be kept in a kettle or a portable furnace. Coloring matter may be added as desired. When a less durable whitewash is sufficient, the above may be modified by leaving out the whiting and glue and omitting the boiling. It need not be applied hot and may be applied with a spray pump.

Whitewash Plus Disinfectant—A more effective whitewash suitable in buildings and yards for disinfecting purposes if there has been virulent disease can be made as follows: dissolve 1 lb lye and $2\frac{1}{2}$ lb water slacked lime in $5\frac{1}{2}$ gallons water. If solution is not used at once it is suggested that it be sufficiently covered to prevent deterioration. This disinfectant is prepared at low cost. It is without odor and is effective against most barnyard disease germs except possibly tuberculosis.

Whiting—Chalk (calcium carbonate) prepared as an impalpable powder by pul-

verizing and washing used as a pigment, especially in putty, cold water paints etc.

Whole Milk Powder—See Milk Processing and Processing Equipment

Whole Milk Powder Fat Test—See Dairy Tests

Whole-Pressed Peanuts—See Feeds and Feeding

Wicking Action—See Cheese

Wide Ration—One with a wide nutritive ratio that is one that contains a relatively small amount of protein in proportion to the carbohydrates and fats.

Wijs Method—See Dairy Tests

Wild White Cattle—Wild cattle said to be direct descendants from giant bulls and from which other breeds may have been developed. They ran wild in large parks in northeast England. They have upright horns shaggy hair are practically pure white in color except for hair about the ear and muzzle which is usually red or black.

Willman Controller—A device for controlling the freezing of ice cream. A thermometer bulb is fitted to project into the ice cream usually through the rear end of the freezer. The capillary tubing from this bulb leads to a unit similar to recording thermometers but instead of the pen arm there are electric contact points which can be adjusted to make contact at any temperature which may be desired. The temperature at which the brine should be shut off from the cooling system is determined by judgment for the first few freezer batches and the electric points adjusted to make contact when the temperature is reached at which the brine is shut off. Thereafter, when the brine off temperature is reached the electric circuit closes flashing a warning light so that the operator will know it is time to shut the brine off. A timing device which starts when the brine is shut off flashes a second warning light when the desired overrun is reached.

Wilstermarsch (Holsteiner Marsch)—See Cheese

Wilt—Loss of freshness as from loss of water as a flower or plant on a dry day. Also a specific disease of plants caused by fungi.

Wilting Coefficient—The percentage of moisture in the soil when permanent wilting of plants takes place

Wiltshire (Truckles)—See Cheese.

Wimmer Process—See Milk, Processing and Processing Equipment.

Wind Break—A strip of trees or shrubs serving to reduce the force of wind, or any specially constructed protective shelter from the wind.

Wind Erosion—The movement of soil by wind. In arid regions this at times becomes very severe and very serious

Windmill—A mill operated by the wind. Also, the wind-driven wheel of such a mill or a similar device used for various purposes as for grinding feed or pumping water.

Winter Cover—See Cover Crop

Winter Vetch—See Feeds and Feeding

Wire Stirrer (in cheesemaking)—See Cheese.

Wisconsin Curd Test—See Dairy Tests.

Witch Grass—See Feeds and Feeding.

Withania Cheese—See Cheese.

Withers—The part between the shoulder bones at the base of the neck in animals—cows, sheep, etc. In dairy cattle, they should be lean and thin.

Wolff Feeding Standards—Wolff-Lehmann Feeding Standard—See Feeding Standards.

Wolffhugel Counting Plate—An apparatus for counting colonies of bacteria. It consists of a hardwood base with drawer. A ruled glass (165 mm. square with a ruled area 120 mm. square) plate is mounted over the base. The ruled area may have a contrasted black or white background to enable the operator to read the colonies accurately

Wood—When used in the dairy, wood should be the kind that imparts no particular flavor or odor to the dairy products that it comes in contact with such as churns and tubs

Whenever possible when dairy equipment is being replaced, metals, particularly stainless steel, should be used.

Woody Flavor—See Butter Defects.

Work—Work done by a force is equal to the size of the force multiplied by the distance traveled in the direction of the force

The foot pound is the work required to raise a mass of one pound the vertical distance of one foot where g equals 32.174 ft./sec². (g means acceleration due to gravity)

Worker-Butter Worker-Butter Working—See Butter

Workmanship Defects—See Butter, Cheese and Ice Cream Defects.

Worm—A term applied to any small, slender, tube like or flat, usually soft-bodied crawling animal as the parasitic types (hookworms and tape worms), etc.

Wrapping Machine—See Butter.

X

Xanthine Oxidase—An enzyme which catalyzes the oxidation of hypoxanthine and xanthine to uric acid and which catalyzes the oxidation of aldehydes. Milk is a rich source of xanthine oxidase. It is associated with the fat globules. A Flavo-protein.

Xanthophyll—The yellow pigment of milk fat. A group of carotenoid fat-soluble pigments synthesized by plants. These range

from deep yellow to greenish yellow in color. Xanthophylls are not absorbed by dairy cattle in quantities proportionate to their occurrence in the food. They are more or less readily absorbed by dry powdered chalk from petroleum, ether, or carbon disulfide.

The name given to one of the pigments in the xanthophyll group, the principal oxygen-containing carotenoid in

green plants, in many seeds, and the one occurring in greatest amount in egg yolk. This pigment has also been called lutein.

X Chromosome—A sex chromosome found in certain animals. When two X chromosomes are present in the fertilized egg a female develops but when there is an X and Y chromosome present, a male develops. This is known as the XY type of heredity and is different from the WZ type inasmuch as the female in the XY type is homogametic and the male is heterogametic.

X Disease—See Diseases in Cattle

Xenia—The direct influence of foreign pollen on that part of the mother plant that develops into endosperm (the nutritive tissue in the embryo sac of the seed plant). Probably the result of double

fertilization, (the nucleus of ovary fertilized by one sperm and the endosperm by another sperm)

Xenogamy—Cross-fertilization

Xerogel—A gel containing little liquid

Xerophthalmia—A disease of the conjunctiva leading to a lusterless condition of the eyeball, which results in chronic inflammation. A deficiency of vitamin A predisposes to it.

Much the same as ophthalmia, an inflammation of the conjunctiva or of the eyeball.

Xerophytes—Plants that grow where rain fall is very limited.

X Ray Treatment of Milk—See Milk, Processing and Processing Equipment

Y

Yama Yogurt—See Milk, Fermented

Yard—The standard American or English linear measurement—3 feet or 36 inches

Y Chromosome—A sex chromosome present in certain male organisms which, under the microscope appears different in size or form from its allelomorphic mate, the X chromosome. Individuals possessing the XY combination are males and those with two X chromosomes are females.

Yearling—An animal that is a year old, or on the second year of its age, applied chiefly to cattle and horses, but also is applied to sheep of that age.

Yeast Holes—Fish Eyes—See Cheese Defects (Texture)

Yeast, Irradiated—See Feeds and Feeding

Yeasts—Small unicellular vegetable cells, usually multiplying by budding and usually causing alcoholic fermentation of sugars.

Yeastly Cream—See Milk and Cream Defects

Yeastly Flavor—See Milk and Cream, Butter and Cheese Defects

"Yellow Body"—See Corpus Luteum

Yellow Milk—See Milk and Cream Defects

Yellow Trefoil—See Feeds and Feeding

Yield of Cheese—See Cheese

Yield—To produce or give forth. Also the total product—as yield per acre, yield of milk per day or year.

Ymer—Yogurt—See Milk—Fermented

Yogurt Cheese—See Cheese

Yoke—A bar or frame of wood made and adjusted so as to pass over the heads or necks of two animals, usually oxen, enabling them to work together as in pulling a load or doing other farm work.

Also a poke or frame worn by an animal to keep it from going through a fence.

Yolk—The total contents of the ovum, or egg cell of an animal. The yellow part of the egg of a chicken.

Yorkshire-Stilton Cheese—Young America Cheese—See Cheese

Yucca—See Feeds and Feeding

Yu Pink—See Cheese

Z

Zakvaska—See Milk—Fermented.

Z Chromosome—A sex chromosome found in birds and certain plants. In this WZ type of heredity the female is the heterogametic sex and has a Z and W chromosome and the male is homogametic and has two Z Chromosomes.

Zebu—(*Bos indicus*)—One of the two principal types of dairy and beef cattle of India, China and other southeastern Asiatic regions and Southeastern Africa, is characterized by the prominent hump over the withers, short horns, large drooping ears, very large dewlap, large navel flap, short stiff hair, loose vascular skin, loose body build—all features evolved to facilitate heat loss (air-conditioners). They also are more resistant to insects and disease.

Like the buffalo's the zebu's milk is high in fat and milk solids. There are a number of Zebu breeds varying in color from grey, the predominant color of the Brahman breed, to cream, white and even black and mixtures of black and white. The best known in the U.S. is the white or grey Brahman brought to Texas many years ago and crossbred with the native cattle. See Brahman and also Santa Gertrudis Cattle. See also Climatic Physiology.

Zeolites—Natural deposits of an opaque vitreous character abundantly diffused in nature, which may be described as double hydrated silicates of aluminum and calcium. When treated with acids they partially dissolve, leaving the silica in a gelatinous state. They are used in the base exchange treatment of milk in order to produce a soft-curd milk, and for ion exchange processes in general.

Zero Fleck—A minute yellowish, or brownish spot marking a fungus infection, as that of rust, which has been overcome by the host.

Zero Grazing—A new term applied to the generally outmoded practice of "soiling." It means no grazing at all but instead cutting or chopping green forage crops in the field and hauling this feed to the cows daily. The practice was generally abandoned years ago because of the large amount of human labor involved in handling the heavy bulky green forage in getting it from the field to the feed

manger. The introduction of the field chopper has, however, materially changed the picture and brought renewed thought and interest to this practice of soiling or zero grazing.

The principal claim for zero grazing, as compared with the usual practice of pasture rotation, is the larger amount of feed nutrients in the roughage that can be recovered per acre of land. With zero grazing, properly managed, there is no waste. All the feed is recovered, while with rotational grazing some feed is wasted through trampling, coverage with droppings and possible overmaturity of a part of the crop.

Ziegel Cheese—**Ziger Cheese**—**Ziger Cheese**, Composition of—See Cheese

Zinc (Zn)—An undesirable metal for use in dairy utensils. Galvanized pails, commonly used for many purposes but which, in the galvanizing process, are covered with zinc, should not be used for dairy purposes because they impart an objectionable, astringent taste to dairy products and also produce certain toxic properties in milk.

Zinc Chloride—A disinfectant quite effective against molds and yeasts and sometimes used to prevent mold and yeast growth on cheese curing shelves.

Zoetic—A term relating to life; vital.

Zomma—See Cheese

Zoology—That branch of biology that deals with the scientific study of animal life.

Zoonosis—See Diseases in Cattle.

Zucker Process—A process perfected by Dr. T. F. Zucker of Columbia University for extracting and concentrating the vitamin D content of cod liver oil. The concentrate is known commercially as "Vitex" and is added to milk to increase its vitamin D content. The concentrate is in the form of sterile cream available in cans of 3 sizes to dose 300 qts., 1,200 qts. and 3,000 qts. of milk to a potency of 400 U.S.P. units per qt.

Zwirn—See Cheese.

Zygote—The zygote is the original cell formed by the fusion of the sperm and ovum which possesses all the hereditary characteristics that will develop in the new individual and many of those possessed by the race from which it comes

Zymogen—A proenzyme The mother substance of an enzyme Often a cell does not secrete the complete enzyme but secretes this so called zymogen which is transformed into an active enzyme outside the cell by chemicals or kinases



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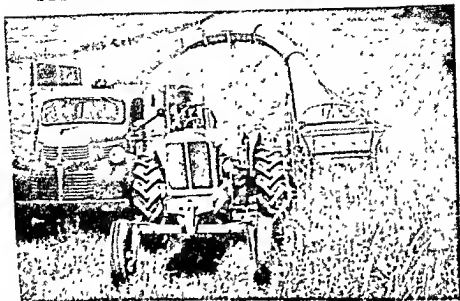


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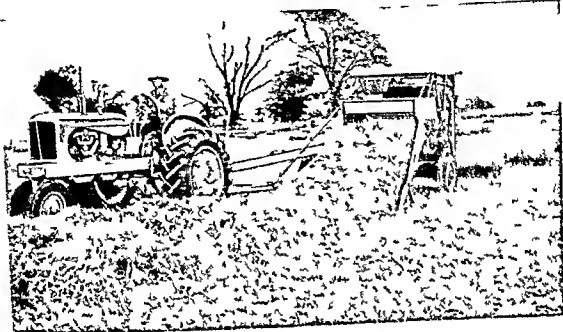
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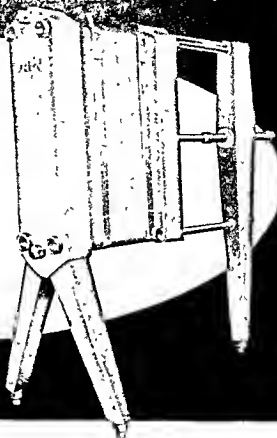
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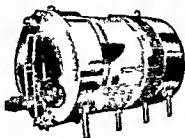
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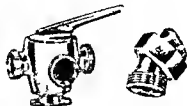
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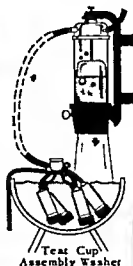
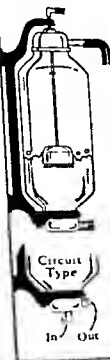
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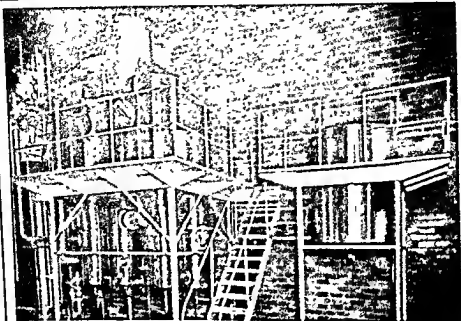
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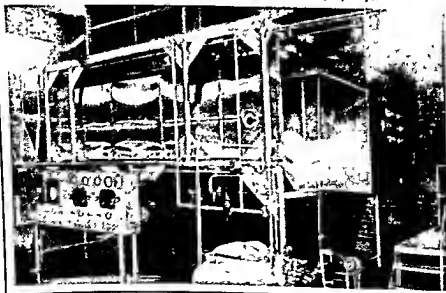
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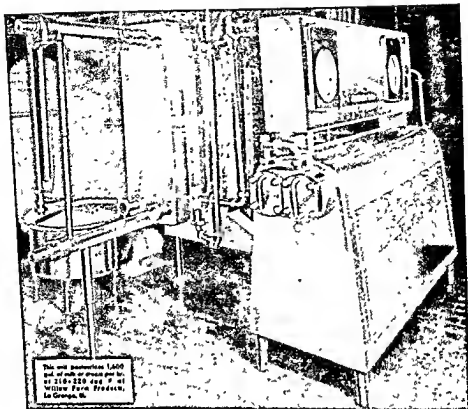


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Dairy - Food - Farm - Beverage - Brewing - Chemical - Equipment and Supplies



Another FIRST for Roswell

Pasteurizing Milk at 210-275 deg. F.

FASTER PROCESSING • FINER FLAVOR • MAXIMAL STERILITY

Now milk, cream, chocolate milk, is being "Roswellized" quicker, at higher heat—following the other Roswell FIRST of 4 years ago in pasteurizing ice cream mix. Roswell "Hi-Heat" pasteurizers were the first ultra high temperature, short time, continuous high capacity processors.

Get Surprising Capacity You run milk through at approximately 15,000 lb/hr at 210-275 deg. F. Capacities of 30,000 lb/hr are achieved with a 4 tube unit.

Have a More Soluble, More Profitable Product Beyond amazing capacity, users are delighted with the sweeter, fresher, cleaner flavor of Roswellized milk. Bacteria is reduced almost to sterility, assuring longer shelf life, reduced returns, and greater safety, especially in long-distance shipping. You get a more uniform product that's more nutritious, easier to digest. For information on this notable advance in dairy practice write directly or contact your nearest Roswell Distributor.

AGAIN...ROSWELL IS FIRST!

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**VAPOR PRESSURE
MILK "DE-ODORATOR"**

NO STEAM NECESSARY... NO
STEAM OR WATER CONTAMINA-
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NO COSTLY CONTROLS, GAUGES
OR GAUGES... ADAPTABLE
FOR IN-PLACE CLEANING...

Remove foam, air, weed and feed odors
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loss of volume by concentration.



CHICAGO STAINLESS EQUIPMENT CORPORATION

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**WESTFALIA
SEPARATOR**

WESTFALIA SEPARATORS FOR ALL DAIRY REQUIREMENTS

MM "Liquid-SEAL" Warm Milk Separators — separate, clarify, standardize warm milk only, five models, capacities from 2800 to 20,000 lbs. per hr.

MN "Liquid-SEAL" Whey Separators — Also separate warm milk, three models, capacities from 7000 to 20,000 lbs. per hr.

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RN "Liquid-SEAL" Clarifiers — hot or cold milk, four models, capacities from 5500 to 22,000 lbs. per hr.

RP Hermetic Clarifiers — clarify hot or cold milk, three models, capacities 5500, 22,000 and 44,000 lbs. per hr.

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MP-S Hermetic Cold Milk Separators — two models, capacities 3500 and 5500 lbs. per hr.

MP Hermetic "TRI-PURPOSE" — separate-clarify-standardize, hot or cold milk, five models, capacities from 1400 to 20,000 lbs. per hr.

Write for name of your nearest WESTFALIA dealer.

CENTRICO
INCORPORATED

75 West Forest Avenue, Englewood, New Jersey

Condé "400"

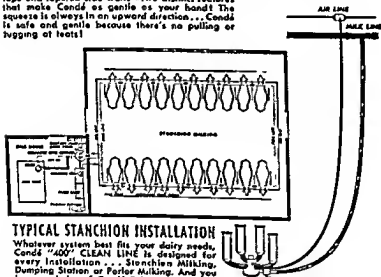
The World's Finest
Milking
Equipment!

CLEAN LINE CLEAN LINE

SYSTEM LEAVES YOUR COWS IN HAND MILKED CONDITION!

The Secret is Condé INFLATION

The Condé "400" patented Inflation has rounded tops and tapered side walls—two distinct features that make Condé as gentle as your hand! The squeeze is always in an upward direction... Condé is safe and gentle because there's no pulling or tugging at teats!



TYPICAL STANCHION INSTALLATION

Whatever system best fits your dairy needs, Condé "400" CLEAN LINE is designed for every installation... Stanchion Milking, Dumping Station or Porter Milking. And you have a choice of Condé Releaser System or Electronic Milking for the milk house.



The Condé milking assembly is all you have to carry into the barn... just a snap connection into the automatic stall cocks and slip the milk line on the sanitary inlet and you have automation from cow to cooler! And the entire system is cleaned and sanitized in one operation... saves labor, time and pays profits!



PACKAGED INSTALLATION

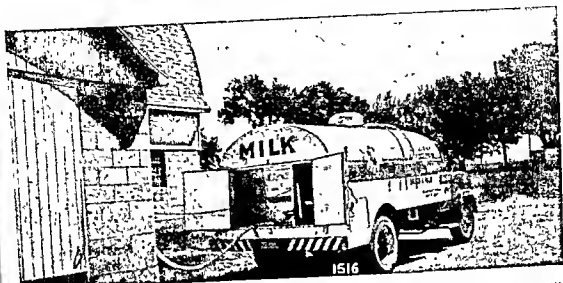
The Electronic Milking Installation is packaged for easy installation... one panel includes almost everything you need in the milk house. Fits into most every present milk house without expensive alterations.

Condé MILKING MACHINE COMPANY, INC.

SNERRILL, NEW YORK

WRITE FOR FOLDER WITH COMPLETE INFORMATION!

How To Get Things Done Better and Faster . . .

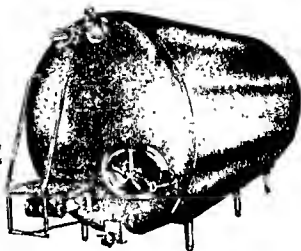


Shows the loading of a Damrow Bulk Milk Pick-Up Tank at a farmer's milk house. Note the rear cabinet, with only two large doors to open and close.

A Damrow Round Horizontal Storage Tank for receiving storing or cooling milk or milk products. Available in sizes from 1000 through 10,000 gallons in round, rectangular, vertical or oval in refrigerated wall or non-refrigerated types.

The Master-Mix Posteurizer shown below is only one of a complete line of Damrow Posteurizers and Process Vats.

For the latest in milk-handling equipment, be sure and consult Damrow, your most reliable source for equipment and service.



Damrow Brothers Company, for over a half century, have dedicated themselves to the manufacturing of only the highest grade of equipment. Such procedures as these are your absolute guarantee of complete satisfaction and lower upkeep and maintenance.

DAMROW BROTHERS COMPANY

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COMPLETE EQUIPMENT FOR THE DAIRY AND FOOD PROCESSING INDUSTRIES



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CREAMERY PACKAGE MFG. CO. OF CANADA, LTD.
267 King Street, West, Toronto 2B, Canada



CP "SC" Crescent Heat Exchanger - Bulletin E-1291



CP Stainless Steel Crescent Heat Exchanger Bulletin E-1155



Multi-Process Tanks Series 40 Bulletin B-225 Series 60 Bulletin B-1129



CP Fruit Feeder Heavy Duty Bulletin M-6



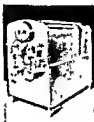
"Dual Wall" Tanks Series 70-Bulletin B-1255 Series 80-Bulletin B-1168



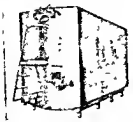
CP Stainless Multi Flo Homogenizer Series DD Bulletin N-1292



CP No. 10 Continuous Freezer Bulletin M-1282



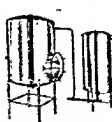
CP M-55 Continuous Freezer Bulletin M-1295



CP Cold Hold Rectangular Storage Tank Bulletin B-226



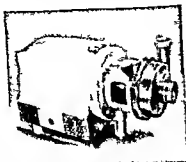
CP "Swept Surface" Heat Exchanger Bulletin E-1300



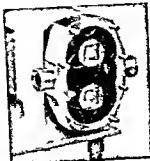
CP "Vac-Heat" Processing System Bulletin B-1255

For more complete information ask your
CP salesman or write direct for bulletins

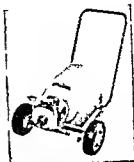
"EVERYTHING IN SUPPLIES, TOO!"



CP Sanitary
Centrifugal Pumps
Bulletin H 1200



CP Stainless Rotary
Positive Pump
Bulletin H 1290



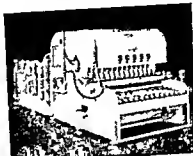
CP Pump
Caddy
Bulletin H 1289



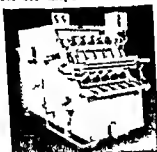
CP Roto-Master Can
Washer—Bulletin I 1066
deal for dispenser cans



CP Milk Cans
Bulletin P 503



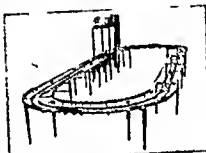
CP Model H Soaker Bottle
Washer Bulletin J 1128



CP Bantam
Jug Washer
Bulletin J 1209



CP 16 Valve Stainless
Steel Filler Bulletin
F 913



CP Conveyor Systems
Bulletin W 1271



CP Type K Multi
Cylinder Booster Bul
letin V 18



CP Type K 4 Cylinder
3 1/2 x 5 1/2 Compressor
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CP Compact Ice Builder
Bulletin V 99a



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BULK FARM COOLING TANKS

There's a MilKeeper for every need — from 183 to 1000 gallon capacity! Ask your CP salesman or write for complete information!

DE LAVAL

Modern Equipment for Today's
Modern Milk Plant



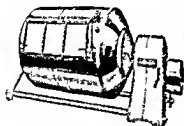
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Standardizing Clarifier
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Disc-Washer
Can-Filling Valve

De Laval Plate Heat Exchangers
For heating, cooling and pasteurizing of milk and milk products



De Laval Vacu-Therm
For removal of off-flavors and feed odors from milk and milk products



De Laval Stainless Steel
Butter Churns
Available in churning
capacity sizes up to
6,600 lbs. of cream



THE DE LAVAL SEPARATOR COMPANY, Poughkeepsie, New York
427 Randolph St. Chicago 5
DE LAVAL PACIFIC CO., 201 E. Millbrae Ave., Millbrae, Calif.

DE LAVAL MILKERS

"For Faster, Cleaner, Controlled Milking"

It doesn't much matter where you put milk—in a pail, or pipe line, or suspended unit—it is how you get it out of the cow that counts. De Laval has always believed that the dairy farmer wants a milking machine that milks fast and clean and doesn't damage or distort the cows' udders. This is what De Laval calls "Controlled Milking"—this is the kind of milking you can expect and get with a De Laval Milker.

De Laval Milkers—pail, suspended, combine—are built to give you better milking . . . cleaner milk . . . healthier udders . . . higher profit.

Prove these things to yourself by calling your local De Laval dealer today and asking for a free trial of a De Laval Milker.

Compare De Laval with any make, any type milker. Then see if you don't agree and then some, with everything said about De Laval Milkers.



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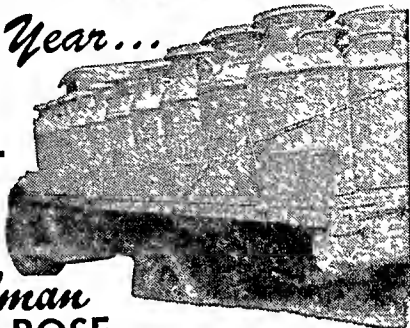
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The choice of thousands of dairymen

Red Rose Dairy Feeds and Supplements are nutritionally balanced with all the required nutrients, body-building proteins, vitamins and minerals cows need for maintenance and top milk production — and they help to earn better profits!

The Red Rose line is complete, too — as it includes rations of various protein quantities to balance any roughage of any quality, supplements to mix with home grains, and medicated rations, as well as rations for calves.

Want to earn better profits from your dairy herd? Then include Red Rose Dairy Feeds or Supplements in your feeding program! See your Red Rose Distributor today and he will help you select the feed that best suits your need.

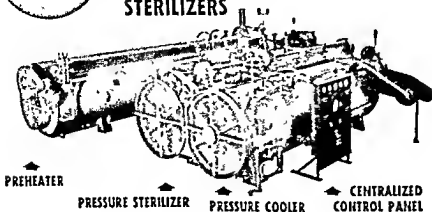
JOHN W. **Eshelman** & SONS
Established 1842

Distributors from Maine to Florida; Ohio to the Atlantic

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Continuous Milk Line Equipment STERILIZERS



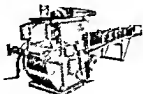
The FMC Continuous Evaporated Milk Line illustrated above is typical of the hundreds of lines that have made FMC equipment the "Standard of the Industry." Positive in-can sterilization provides the highest uniformity to large capacity, high-speed operation. Every can is processed evenly and exactly alike, allowing a selective degree of quality to be maintained with utmost dependability.

FMC lines are designed to handle standard 6 oz., 14½ oz. and 16 oz. can

sizes, and can be built for a wide variety of other can sizes. Other milk products processed at low cost per case include canned concentrated non-fat milk, liquid infant formulations, canned chocolate-flavored milk, combined milk, and other milk concentrates.

Through FMC research and engineering, coupled with technical and mechanical service, you are assured of maximum operating efficiency with minimum maintenance.

NON-SHOCK CASER



Automatically places cans in cases free of damaging impact to cans, labels or product. Speeds to 1200 cases per hr

AIR-BLAST CAN DRYER

Efficiently dries cool cans without reheating at capacities up to 450 CPM, depending on can size. Available in horizontal and inclined models.



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Conveyors • Labellers • Case Sealers

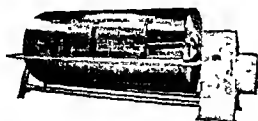


FOOD MACHINERY AND CHEMICAL CORPORATION

Canning Machinery Division

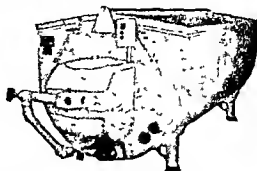
General Sales Offices
WESTERN: SAN JOSE, CALIF. • EASTERN: HOOPESTON, ILL.

EQUIPMENT OF PROVEN PERFORMANCE



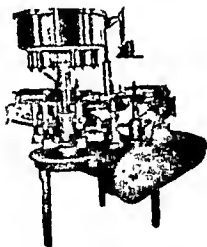
VANE ALL-METAL CHURN

Famous criss cross working action retained in new all metal, one piece construction. New Temp-Tube circulates water within baffle pole, controls butter temperature during working. Over 25 years experience proves butter will not stick to metal used in churn.



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With sanitary seals and stainless steel or tinned copper coil. Sanitary full opening covers for easy, thorough cleaning and inspection. The oval shape of the coil makes heating faster, yet agitation smooth. Sizes 200 1000 gal.



SPECIALTY Automatic Rotary FILLER AND CAPPER

Half pints to gallons, round or square. Conical paper bottles. Built in conveyor—variable speed drive. Six valve—one capping head.



SPECIALTY Hand-Operated FILLER AND CAPPER

16 gallon capacity stainless steel tank and cover. Two models available—four valves and two cappers (illustrated), two valves and one capper. Fills quarts, pints or half pints. The 2 valve machine fills all sizes.

GENERAL DAIRY EQUIPMENT INC.

MINNEAPOLIS 14, MINNESOTA



CHOCOLATE FLAVOR POWDERS

The Choice of Discriminating Dairymen

PRODUCTS: Chocolate Flavor Powders for Chocolate Milk Drinks
Chocolate Flavor Powder for Ice Cream

The superior quality of FORBES CHOCOLATE FLAVOR POWDERS is the result of over fifty-five years of experience in the chocolate business. FORBES products are compounded with the utmost care and skill. They offer a TRUE chocolate flavor, without bitterness or sediment. Economical and easy to use.

Forbes No. 271 CHOCOLATE FLAVOR POWDER

A fully sweetened powder for chocolate milk drinks. Packaged in 5 lb. lined Kraft paper bags, 10 to a carton, 60 lbs. net . . . Also in 48-lb. multi-wall Kraft shipping bags. Use this 48-lb. batch size bag to 80 gallons milk base for 84 gallons finished . . . or 60 lbs. to each 100 gallons milk base for 105 gallons finished.

Forbes No. 5 CHOCOLATE FLAVOR POWDER

Mildly sweetened for chocolate milk drinks. The addition of No. 5 to a good fresh sweet milk base produces a full-bodied drink with a rich chocolate flavor, not too sweet when heated and served as hot chocolate. Packaged in 5 lb. lined Kraft paper bags, 12 to a carton, 60 lbs. net . . . also in 50-lb. multi-wall Kraft shipping bags. Use 50 lbs. to 100 gallons milk base for 104 gallons finished.

Forbes SEMI-SWEET CHOCOLATE FLAVOR POWDER

An excellent combination, slightly sweetened to insure rapid dispersion when added to the milk. Packaged in 5-lb lined Kraft paper bags, 12 to a carton, 60 lbs. net. Use 25 lbs. of SEMI-SWEET and an equal amount or more of sugar to each 100 gallons milk base for 105 gallons finished chocolate of a rich, reddish-brown color, top quality.

Forbes MOAROMA CHOCOLATE FLAVOR POWDER

Unsweetened powder for chocolate milk drinks. A good chocolate flavor. Packaged in 7½ lb. lined Kraft paper bags, 6 to a carton, 45 lbs. net. Use 15 lbs. plus 50 lbs. sugar to 100 gallons milk base for 105 gallons finished.

Forbes ICE CREAM CHOCOLATE FLAVOR POWDER (Dry Mix)

For flavoring ice cream mix. Imparts a true chocolate color to the ice cream and a rich chocolatey flavor. An extra quality product to be added to plain mix before pasteurizing or directly to the ice cream mix at the freezer. Packaged in 3-lb. and 6 lb lined Kraft paper bags. Cartons contain 48-lbs. net. Use 6 lbs. to 10 gallons ice cream mix. Frozen products with less than 100% over-run do not require as much FORBES Powder as recommended above for ice cream.



Forbes Chocolate Flavor Powders are packed in multi-wall Kraft shipping bags and batch size packages in cartons. The batch-size bags have an inner lining (glassine or waxed sheet), and are packed in specially constructed cartons made with water-proof adhesive to protect the product against dampness or moisture and assure a dry, fluffy powder.

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Forbes

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— In Sanitary Products designed
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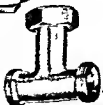
- Sanitary Valves
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- Stainless Steel
Holding Tubes and
Stands



Valve No.
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No. 12HR
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No. 7A Tee

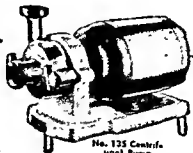


Exploded View of C I.P. Union

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Literature*



Holding Tube Assembly



No. 135 Centrifugal Pump



PRODUCTS CORPORATION

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KENOSHA, WISCONSIN

America's No. 1 saleswoman is Elsie the Cow. Eight out of ten Americans, on farms and in cities, know Elsie's name and know that she works for Borden's.



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To consumers — and particularly consumers' children — Elsie stands for milk and dairy products. She is an old familiar friend, advising them to use more and more milk and ice cream and cheese. And her cheerful face in advertisements and on packages is a reminder that if it's Borden's it's got to be good!

But to farmers, Elsie is an efficient marketing agent. A link between the cow barn and the consumer's table, she transforms the produce of thousands of farmers into health-giving foods for millions of American families.

Making the market for milk products bigger and better is Elsie's job — and she loves it!

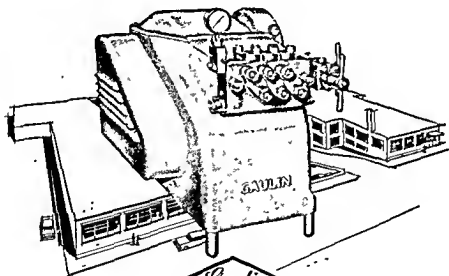
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*General Foods Corporation
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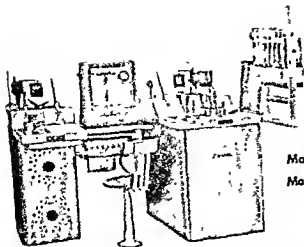
Dairy Pipe Department
Section D H

Corning Glass Works
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Machine Co • J C Marlow Milking Machine Co • Rite Way Dairy Farm Equipment
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Mojonnier

Model D Milk Tester

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CASH VALUE!**

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This interesting, informative chart gives the dollars and cents value of accuracy in the case of various dairy products. Send for it today—no charge or obligation.

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For the

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1. The new

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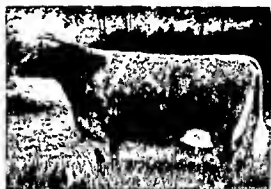
The National Association of Artificial Breeders
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Columbia, Missouri

MILKING SHORTHORN CATTLE



*Model
Type*



"Milking Shorthorns were imported from England and first recorded in the United States in 1846. They are red, white and roan in color, commonly known as Durham. Good quality cows are expected to weigh 1350, produce 8,000 to 10,000 lb. 4% milk, principally on roughage. They are tops in salvage value."

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Extra early maturity

Extra production efficiency

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Extra style and beauty

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The earlier maturity of Jerseys means they are working for you sooner than other breeds. Their extra production efficiency means they will produce more milk per pound of feed or per pound of body weight.

Records indicate Jerseys have greater longevity and that they hold up better in production during hot weather. On pasture they have the "go" that harvests the grass and makes that extra profit per acre. In the barn their extra style and beauty and their greater ease of handling delight every Jersey owner.

It would pay you to look into the extra opportunities of owning registered Jerseys and producing All-Jersey Milk. Write for information today.



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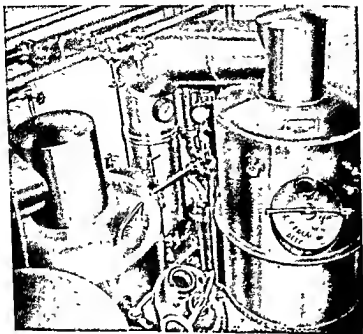
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We welcome the opportunity to quote you on these and other items for efficient and economical plant operation.

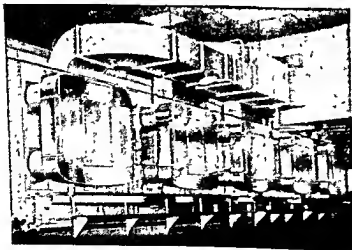
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*Write for Details of the Latest Advances in Milk Evaporating
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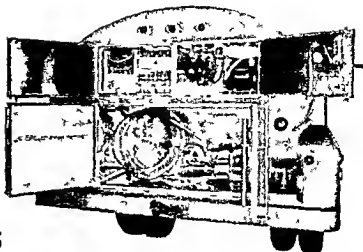
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BULK MILK

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Individual compartments for pump, samples, and motor-reelite. Available with or without rear head of tank exposed to pump compartment for compartment temperature control. Balanced to suit customer's chassis or tractor and laws of states in which unit will be operated.

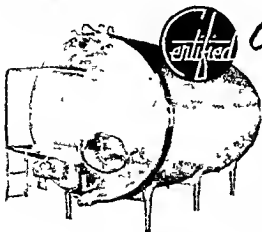
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For long or short haul, CERTIFIED milk transport tanks assure long service and low cost per mile. Available in all sizes from 500 to 5,000 gallons. All CERTIFIED equipment equals or surpasses 3A Sanitary Standards. Write for Bulletin TT-1A.



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Features: (1) Hollow shaft gearhead motor. No troublesome flexible coupling. (2) Streamlined legs provide accessibility of tank bottom for cleaning. Cylindrical or rectangular, horizontal or vertical, refrigerated or non-refrigerated models.

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Certified Dairy Equipment Division

STAINLESS & STEEL PRODUCTS COMPANY

1000 Berry Avenue / St. Paul, Minnesota

WHEN YOU THINK OF SOFT-SERVE—THINK OF SWEDEN

... And you should think about soft-serve and the important part this popular product can play in your operation—and when you do, Sweden, the recognized leader in the field, is your logical choice for selecting the proper equipment to do the job.

More and more ice cream stores are finding that soft-serve products are becoming increasingly important to them in their business. Not only do soft-served products provide the needed margins for a profitable operation, but the appreciation and demand for soft-serve products helps them meet the growing competition of specialty stores, restaurants, drug stores and other outlets that have recognized the value and potential of soft-served products. With greater volume, these ice cream stores find that impulse buying of "take-home" hard ice cream is also increased.

When it comes to equipment, Sweden is the logical choice. Durable Sweden equipment is precision-built for efficient, trouble-free service. It is easily run by unskilled personnel. Simple, trouble-free

controls assure proper operation at all times — speeds service, increases volume, boosts profit.

Every piece of Sweden equipment is manufactured to the highest standards of material and workmanship by the Sweden Freezer Manufacturing Company, pioneer of soft-serve freezers and malt-shake machines. More than 25 years of practical experience and engineering knowledge, plus modern plant facilities are devoted to making equipment that brings its owners the maximum dollar profit for every dollar invested.

And every piece of Sweden equipment is sold thru the most complete sales and service organization in the field and backed by a liberal factory guarantee. Sweden dealers receive factory training and are assisted by factory-employed representatives — to assure every Sweden owner the maximum profit and service from his Sweden equipment.

Yes, soft-serve is something you should think about, and when you do, think of Sweden, the pioneer and leader in the field — your logical choice.



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PIONEER AND LEADER IN THE SOFT-SERVE FREEZER
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■ Easy to use, quickly dispersed. ■ Easily controlled overrun, dry from freezer. ■ Retard ice crystal growth. ■ Provide maximum heat shock protection through transit. ■ Heat shock protection in store.

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*Because they're specialized, uniformly dissolving, cube
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uniform salt content and flavor. Cost less. Have high
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Plenty always available. Try them and see the difference!*

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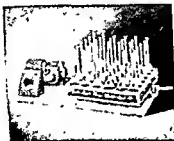


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A complete line of electric, hand operated, or combination hand and electric testers from 8 to 36 bottle capacity. Advanced features include Viscope (the most accurate speed indicator known), variable speed control, thermostatic heat control, mounted thermometer and many others.



Babcock Test Bottle Shaker

Has an ovate movement that closely simulates hand swirling. Completely integrates acid with milk or cream . . . assures uniform testing . . . eliminates possibility of burns to operator . . . saves time. Test bottles may be loaded while shaker is in motion. Available in 12, 24 and 36 bottle models with either stationary or removable tray.

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"Babcock Tester Manufacturers for Three Decades"

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- REAM — Powder cleaner for CIP installations
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Supreme quality product, the finest blend of Mexican and Bourbon beans grown. Well aged - mellow, rounded flavor.

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Finest quality compound vanillas made with a base of pure vanilla.

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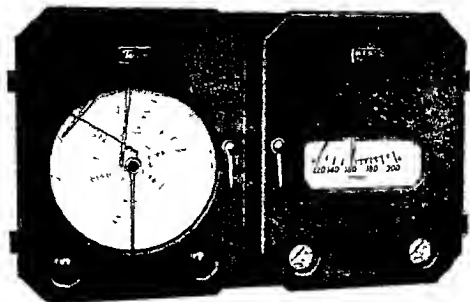
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**PAUL - LEWIS LABORATORIES, Inc.
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For SAFER and BETTER MILK



Taylor HTST CONTROLLER

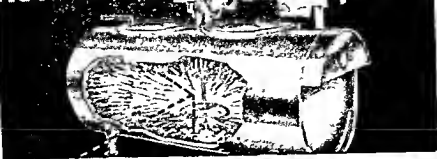
Your vigilant ally for the production of safer and better milk—the Taylor HTST CONTROLLER. It features—

1. **Greater Protection.** Faster speed of response of temperature system plus the new Taylor Flow Diversion Valve provides unprecedented speed of diversion when milk temperature falls below legal limit.
2. **Simpler Operation.** All control adjustments are ideally preset at the factory, making further adjustments unnecessary.
3. **A Completely Automatic System.** Just set to the desired temperature.
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Taylor Instrument Companies

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AUTOMATION by ZERO



TORNADO in Milk Tank CUTS CLEANING Time!

The girl above, with a touch of her fingers, controls a tornado . . . an automatic, cleansing tornado in a farm milk tank. Simply turning a control knob puts Zero's Spotter-Spray to work for you.

This is an exciting new, labor-saving system that's attracting national attention. Already it's saving dairy farmers countless hours of tedious wash-up time.

Because Zero's founder was a dairy farmer who decided to take the drudgery out of dairying, Zero has for 20 years pioneered a long line of labor-saving equipment.

Zero's completely round tank—with its elimination of inaccessible, unsanitary corners, hard-to-reach bridges and large, awkward lids—has proved easier to clean than any other tank. Zero's vacuum system made expensive, complicated releasers unnecessary—made the Zero tank simply an extension of the milking machine milk pail.



**VACUUM, Nature's Own
Way, Makes New
System Possible**

The new Spotter-Spray system is a natural evolution. Exactly the same features that have always made Zero's round vacuum tank easier to brush clean make it possible today to wash automatically. It's a logical development of Zero's Super Strainer, direct cow-to-tank hook-up, and other Zero labor-savers.

Mechanically, it's simple. The variable speed motor turns the agitator at low speed during cooling, at a faster speed for butterfat testing. When the tank is empty the agitator spins at top speed . . . to wash, rinse and sanitize.

Zero offers you a tank with a future. Write today for complete information. No obligation, of course.

While You Enjoy Zero's EXCLUSIVE
SPATTER-SPRAY IN-PLACE CLEANING . . .

ZERO'S T-20 "GROWS" WITH YOUR NEEDS

Zero T 20 will brighten your profit picture Use the Zero T 20 with any of the methods shown below . . . then save additional time and labor as your herd grows by adding to your system, your Zero T 20 is the most flexible bulk milk tank on the market today!

Use It As A Pour-In

Many dairymen start by using the pour in method with the Zero tank. The round design allows the operator to stand close to the trailer, easing the lift and lowering the pouring height. Pouring may be done conveniently from either side. Use the pour in method first. Then switch to vacuum milking when ready. It's that easy!



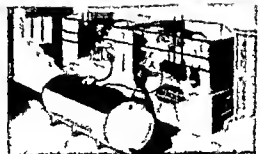
Use It With Zero's Super-Strainer.

Just like sucking milk through a straw. Vacuum using nature's own way—eliminates lifting heavy milk pails. With your Zero Super Strainer you can draw a pail of milk into the tank in approximately 30 seconds. Saves cost of pour in strainer. Removes many feed and cow odors and animal heat. Saves electricity, too.



Use It Cow-To-Tank.

Here is the ideal goal for your planned milking system . . . milk flows direct from cow to cooler. Your milk is drawn direct from cow to tank and refrigerated by vacuum in Zero's T 20 Farm Tank. Best of all, your present buildings can be adapted for use with this ultra modern system. No cost ly releasers or pumps necessary.



Use It With Direct Pipeline:

Here is the finest system of automatic milking ever devised for small and large sized dairies. Direct pipeline with Zero T 20 enables any dairyman to operate with an absolute minimum of time and effort. Rapid cooling under vacuum prevents bacteria growth . . . Improves milk flavor.



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